August 1983
Vol. 9, No. 8
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Computers And People

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- Texas Instruments CC-40
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- Word Plus—PC
- HomeBrain
- The Eye

The Heartbreak Of Cyberphobia

Marriage In The Computer Age

Are You A Creative Person?

Report From NCC '83

New: Street Price Index

Home Control

Computer Ethics

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0 14024 14044

ANNOUNCING THE END OF THE DISPOSABLE COMPUTER.

THE REMARKABLE
SV-318 PERSONAL COMP
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SPECTRAVIDEO
SV-318

FOR

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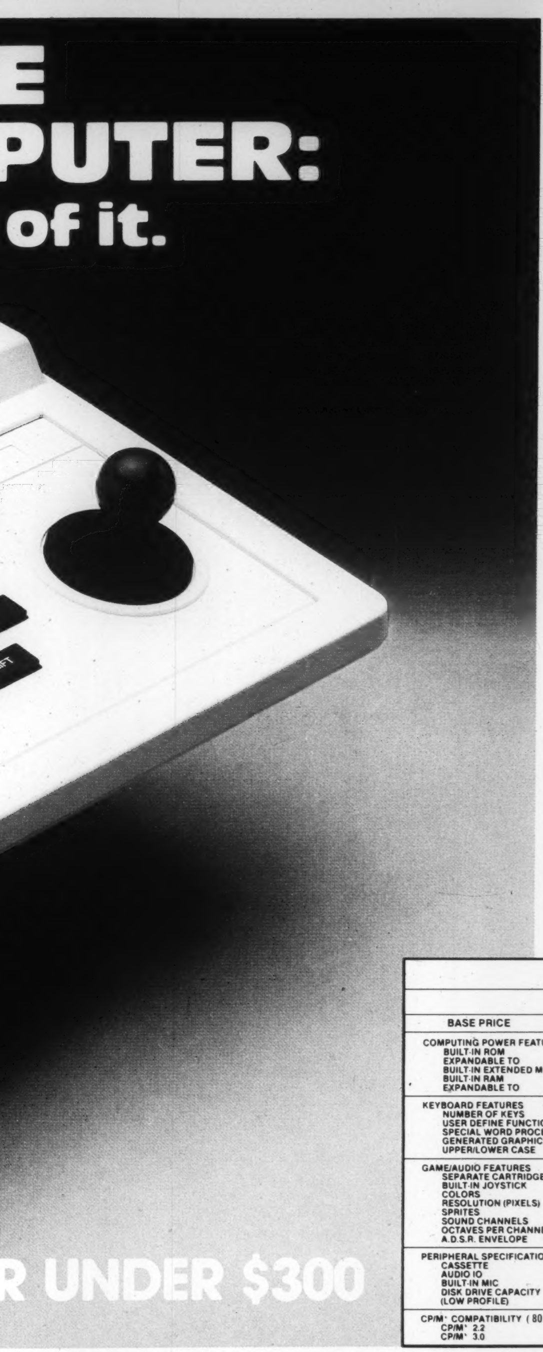

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	SPECTRAVIDEO SV-318	APPLE II PLUS	ATARI 800	COMMODORE 64	NEC 6001	RADIO SHACK COLOR COMPUTER
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COMPUTING POWER FEATURES						
BUILT-IN ROM	32K	12K	10K	20K	16K	8K
EXPANDABLE TO	96K	N/A	42K	N/A	32K	16K
BUILT-IN EXTENDED MICROSOFT® BASIC	YES	YES	ADDITIONAL COST	NO	YES	ADDITIONAL COST
BUILT-IN RAM	32K*	48K	16K	64K	16K	4K
EXPANDABLE TO	144K**	64K	48K	N/A	32K	16K
KEYBOARD FEATURES						
NUMBER OF KEYS	71	51	61	66	71	55
USER DEFINE FUNCTIONS	10	N/A	4	8	10	NONE
SPECIAL WORD PROCESSING	YES	NO	NO	NO	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	NO	YES	YES	NO	NO
UPPER/LOWER CASE	YES	UPPER ONLY	YES	YES	YES	YES
GAME/AUDIO FEATURES						
SEPARATE CARTRIDGE SLOTS	YES	NO	YES	NO	NO	NO
BUILT-IN JOYSTICK	YES	NO	NO	NO	NO	NO
COLORS	16	15	128	16	9	9
RESOLUTION (PIXELS)	256 x 192	280 x 160	320 x 192	320 x 200	256 x 192	128 x 64
SPRITES	32	N/A	4	8	N/A	N/A
SOUND CHANNELS	3	1	4	3	3	1
OCTAVES PER CHANNEL	8	4	4	9	8	10
A.D.S.R. ENVELOPE	YES	NO	NO	YES	YES	NO
PERIPHERAL SPECIFICATIONS						
CASSETTE	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	1 CHANNEL	1 CHANNEL
AUDIO IO	YES	NO	YES	NO	NO	NO
BUILT-IN MIC	YES	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	143K	96K	170K	N/A	170K
(LOW PROFILE)	YES	NO	NO	NO	NO	NO
CP/M® COMPATIBILITY (80 column programs)						
CP/M® 2.2	YES	NO***	NO	NO****	NO	NO
CP/M® 3.0	YES	NO	NO	NO	NO	NO

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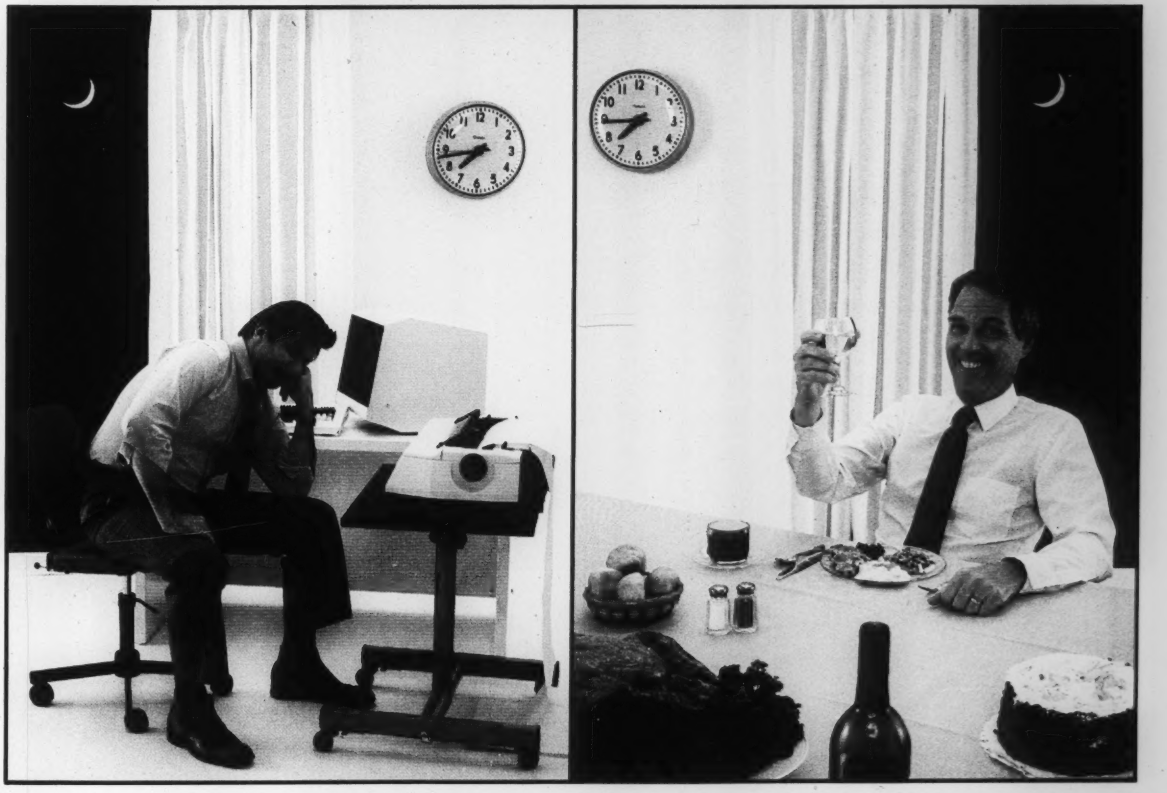
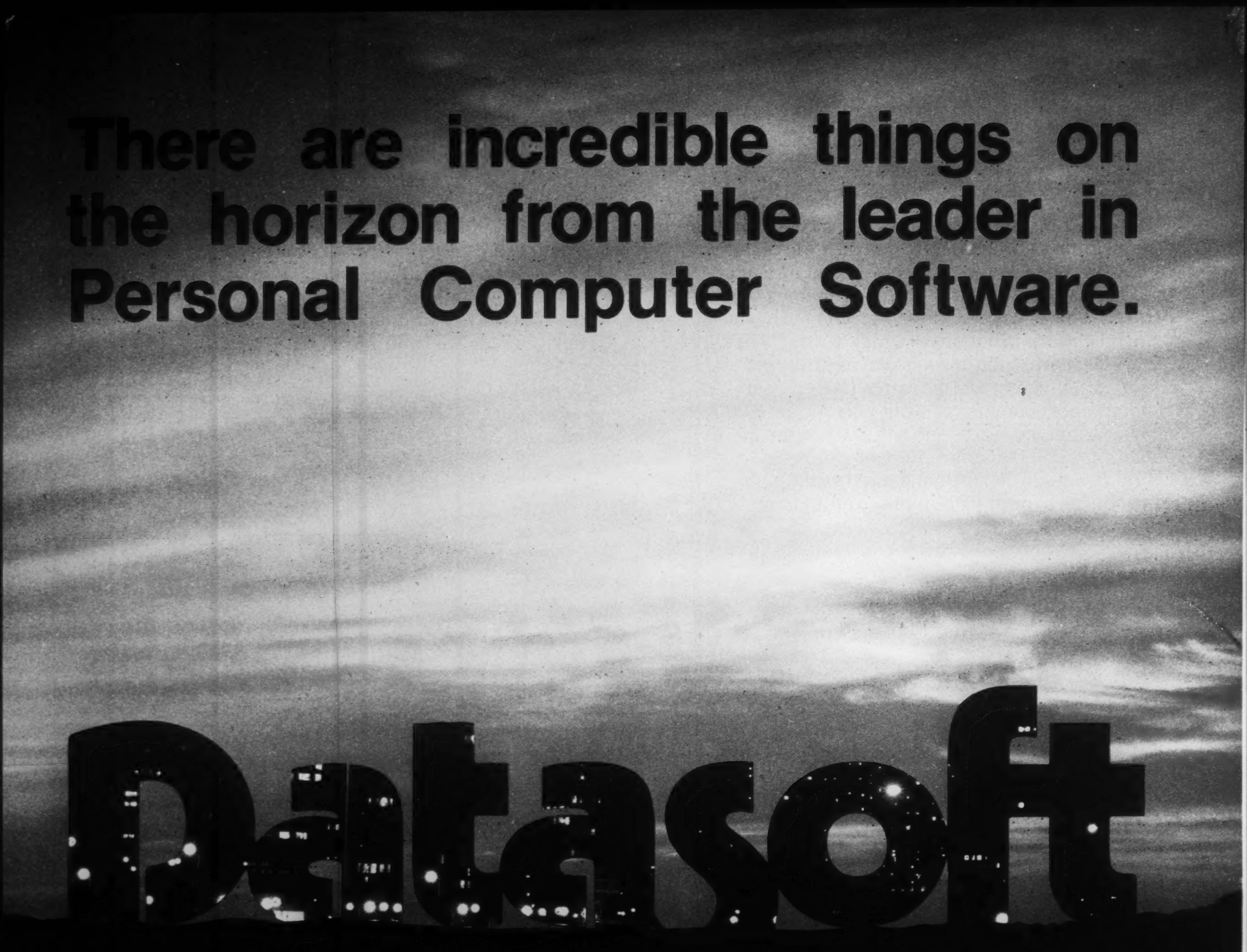
GUESS WHO HAS MICROBUFFER.™

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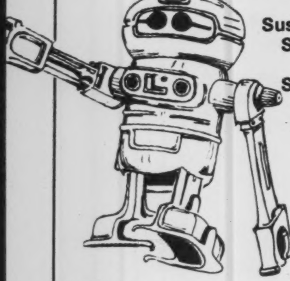

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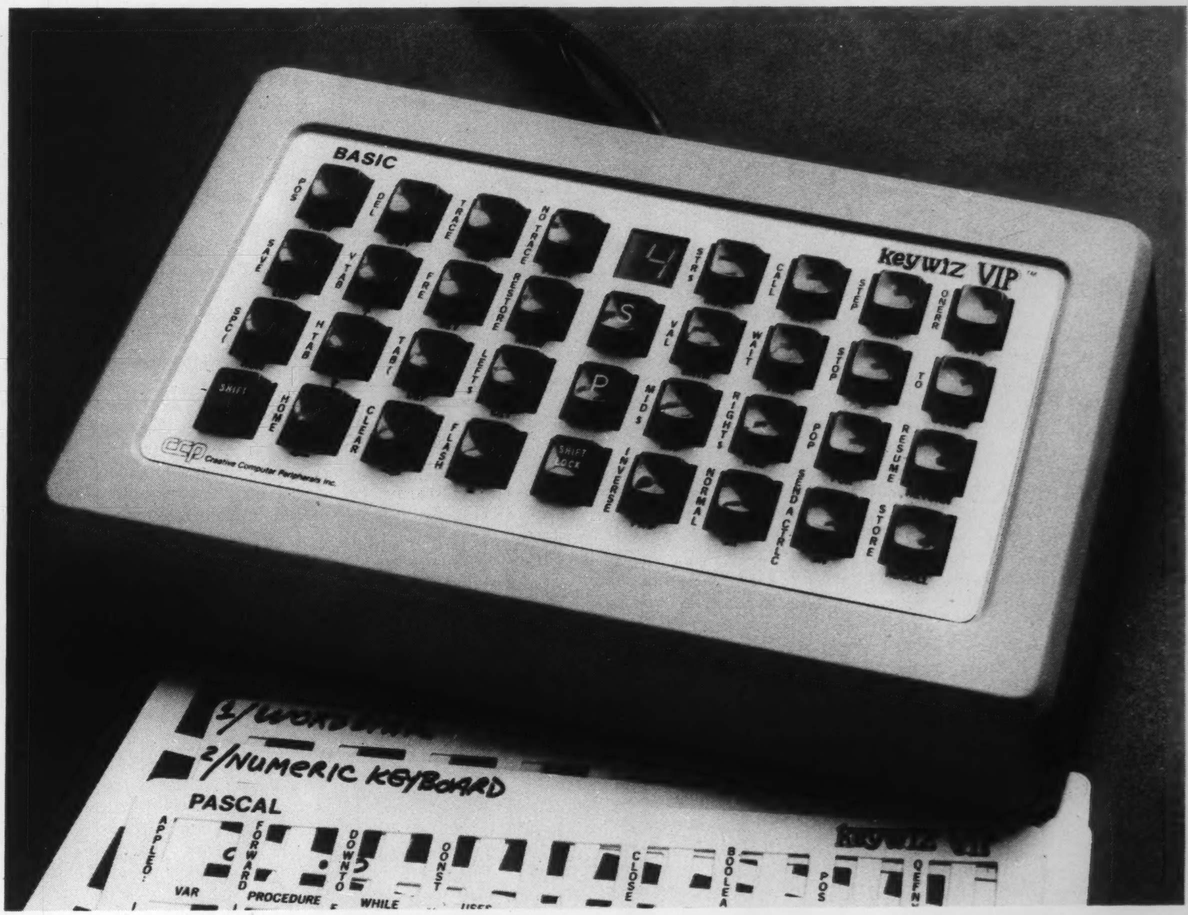
(ALL 248 OF THEM!)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CIRCLE 112 ON READER SERVICE CARD

tput...input/output...inpu

Oh, Hal

Dear Editor:

If a professional programmer made such a glaring error that even the novice could see it, you might question that programmer's credibility. That supposition also extends to book reviews. The reviewer of *2010: Odyssey 2* by Arthur C. Clarke in the May issue may, indeed, be an Arthur Clarke fan and may have read *2001*, but every science fiction hacker worth his/her BEM's (bug-eyed monsters) knows "The Sentinel" was the basis for *2001*, not the novel *Childhood's End*.

Cynthia Cox Yarborough

Intergalactic egg-on-the-face dept: You are quite right. In 1950, Clarke's short story "The Sentinel" introduced a mysterious artifact on the moon, that later evolved into the monolith of 2001. *At the time of the film, 15 years later,* Childhood's End *was Clarke's most recent work.*

In The Making of Kubrick's 2001, *by Jerome Agel, a number of parallel quotations are cited from* Childhood's End. *There also appears in the book a 1970 quote from Clarke himself, which bears out, I think, the credibility of my review: "I'll be able to mine the debris from* 2001 *for years," he said. —JJA*

Battery Operated Burglars

Dear Editor:

In the May issue, you printed an article by Mr. Kel Hess about using a computer to act as a burglar alarm. While the effort put forward by Mr. Hess was very creative, it suffers from the greatest of defects, namely the loss of primary power.

One of the chief faults in many systems is their inability to continue to operate after sustained loss of primary power. Burglars simply cut the wires and wait for any batteries to run down, then go help themselves.

Above that, you should warn your readers, and Mr. Hess, that almost all 50 states have laws forbidding any automatic devices dialing 911 emergency numbers or any police or fire department phones. The reason is, that the machines don't know when to hang up thus blocking emergency communications. Mr. Hess even designed a repeat call-back feature into his software, which is what most police and fire departments dislike about such systems.

I would strongly suggest, that if you are willing to put out $3000 for equipment, and are unwilling to pay for insurance, that you should be willing to put out another $3000 for alarm equipment, because that is what it would cost you to replace the stolen equipment. This way you will only have to do it once.

Bruce D. Anderson
Brand Consultants
853 Broadview Dr.
Lawrence, KS 66044

Shell Shock

Dear Editor:

Howard Kaplon may have gotten in over his head in the statistical analysis of his data in "A Comparison of Sorts, Revisited," May, 1983.

In Table V, he calculated the population standard deviation, whereas it would have been correct to use the sample standard deviation (N-1 weighting). His reported standard deviations are, therefore, too low.

Furthermore, it doesn't make any sense to average regression constants over samples which contain mostly the same data, as Mr. Kaplon has done.

Finally, although it is obvious that it takes no time to sort no data, the most accurate regression equations are obtained without the constraint that the regression line must pass through the origin.

Mr. Kaplon's Table VI should have been based on a regression of his ten data points, rather than any average:

Shell-Metzner: T=.956N1nN - 502
Quicksort: T=.527N1nN - 99

These equations give slightly higher predicted sorting times than Mr. Kaplon's.

In the Quicksort Flowchart in the same article, the initial values of R and W(K) should be the number of items being sorted, not 1 as given.

Edward Berne
5626 Appleridge Tr.
West Bloomfield, MI 48033

Coding Colons

Dear Editor:

I'd like to comment on Wheeler and Peeri's fine cryptography article in the May 1983 *Creative Computing*.

Many readers will doubtless expand the programs to be stored on and read from tape or disk. Problems may arise. Most personal computers use special characters—usually comma and/or semicolon and/or colon—to keep strings straight. Also quotation marks in the wrong place can terminate a string. The chances are good that, if a message is long enough, the randomly generated characters will produce a control character in the wrong place and destroy part of the message.

To avoid this problem store the enciphered letters as numbers rather than as characters. A good way to do this is to store everything in an integer array and then read the array onto the storage medium. When the array is read back it can be translated into characters.

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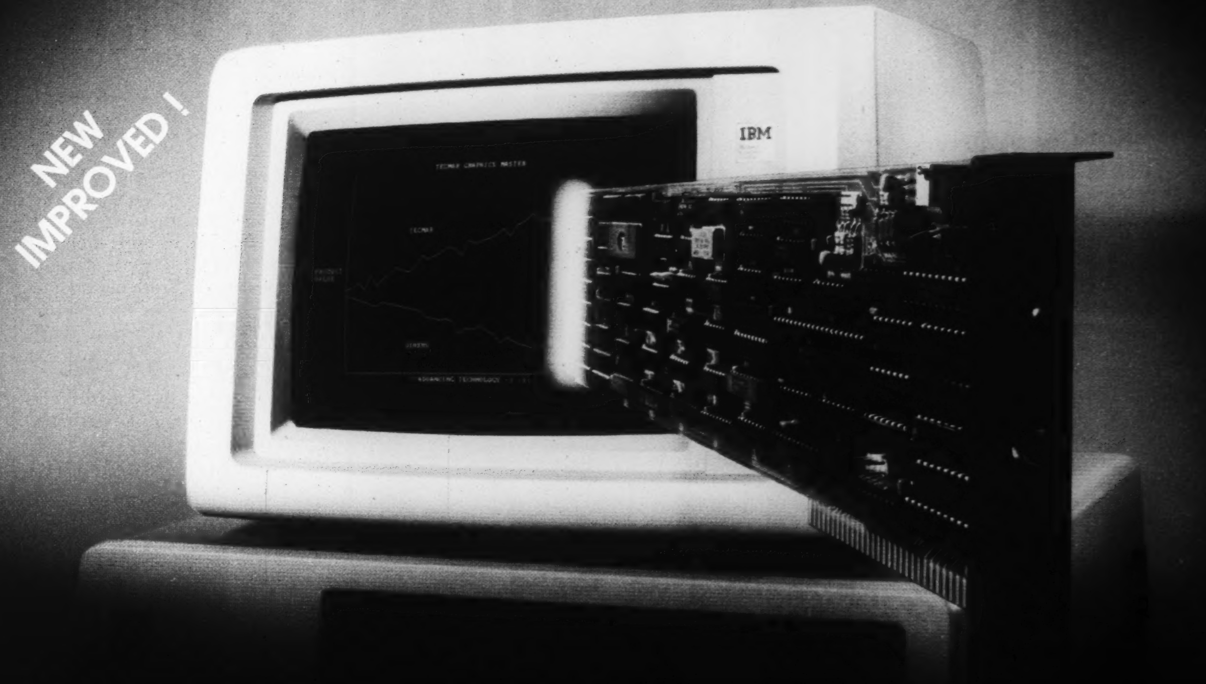

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Graphics Master can do much more. In all, over 30 different display modes can be used on standard monitors, and over 25 on the IBM Monochrome Display.

With certain monitors, you can achieve super-high resolutions like 512 horizontal x 420 vertical in up to 16 colors *without interlace*.

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Graphics Master retains complete compatibility with the IBM Monochrome and Color Graphics Adapters. Use it to accompany or replace one or both of the IBM cards.

CIRCLE 218 ON READER SERVICE CARD

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tput...input/output...inpu

Manual Over Drive

Dear Editor:

I am writing about the Color Computer Disk System review I wrote that appeared in the March, 1983 issue of *Creative Computing*. I have received many nice letters and queries regarding the article, and I would like to pass along some information.

Many people asked me how to order the service manual for the disk system, as many store managers are telling them that they are not available. I asked the person from whom I ordered mine, and he passed along the following information.

There are two disk system manuals, one for the drive unit and one for the controller card. The part numbers for the manuals are MS-2603022 and MT-2603022 respectively. If the store manager tells you they are not available, tell him that they must be ordered from Tandy's national parts distribution center, rather than from computer sales.

I apologize for not answering all of the letters I received personally. Postage is too expensive to answer all requests individually. Those who sent a self-addressed stamped envelope got an immediate reply.

One last comment on an error in the disk system operators manual. I stated that the COPY command is not available to users of single drive machines. I have since found out that COPY does work with only one drive. The proper syntax for single drive operation is COPY filename/ext. You will be prompted as to when to switch disks. COPY is non-destructive of a program in memory, unlike BACKUP and DSKINI.

John Steiner
508 Fourth Ave. NW
Riverside, ND 58078

Convention Corrections

Dear Editor:

Some warnings are appropriate for potential users of the program given in "Financial Analysis For The Apple II" (Feb. 1983, pp. 188-206). The program calculates correct *daily* internal rates of return. However, it violates established conventions dealing with monthly and annual instruments.

For example, the loan analysis on page 190 deals with a loan of $6000 repaid by 35 monthly installments of $213.92 and a final payment of $213.76. The federal Truth in Lending Act governs the disclosures of (true) Annual Percentage Rates (APR), and requires this loan to be analyzed by calculation of a monthly rate which is multipled by 12 to obtain a quoted annual figure. The effective rate used by the financial community and required by law for disclosure on this loan is 17%. Unfortunately, the program states a "true" effective yield of 18.434%.

The final answer is unacceptable and conceptually incorrect, because the calculation assumes that the true rate is a daily rate which is compounded daily for a year to obtain a true annual rate. Mortgage interest is not earned daily, nor is it compounded for the lender in that manner.

Without modification, this program will give answers that overstate the annual rate on monthly instruments such as mortgages, and will give answers which are inconsistent with the disclosure requirements of the Truth in Lending Act. (See, for example: Board of Governors of the Federal Reserve System. Section 226.40 of Regulation Z (Supplement I) Truth in Lending, as Revised January 10, 1982.)

Matthew J. Hassett, Ph.D.
A.S.U. Mathematics Department

Lynn Kurtz, Ph.D.
A.S.U. Mathematics Department

Daniel J. Hunter
Mortgage Broker

Cipher Fix

Dear Editor:

My article on "The Secret Code Machine" in the May issue of *Creative Computing* has attracted some comment but, more important, some suggested modifications, extensions, and corrections.

At least one typographical error crept into the listing accompanying the article (my fault!): Line 5030 should read GOTO 5030 (not the non-existent 5010). Furthermore, the entire routine from 16000 through 16150 is redundant and should be deleted.

More important, Martin's cub master, Peter Charlton, points out that the encypherment/decypherment routines do not handle j correctly. The fix is to add:

```
14214 IF LEFT$(ME$(M),1)="J" THEN ME$(M)="I"
+RIGHT$(ME$(M),1)
14215 IF RIGHT$(ME$(M),1)="J" THEN ME$(M)=LEFT$
(ME$(M), 1)+"I"
```

Incidentally, Mr. Charlton has modified the program to run on an Apple II+ (without the printer routines) and would be pleased to supply a disk version for the usual $5 sent to 305 Summit Ave., Ottawa, Ontario.

Finally, a number of Commodore 64 users have requested the program. The only changes required to the 40-character version relate to the C64 use of the old Basic 2.0 in its handling of disk routines. Whether you are typing in your listing or have bought a disk or tape from me, simply make this change:

```
2420 IF RR$="D" THEN LOAD"PLAYFAIR.40",8
```

Otherwise, all systems are GO.

Gordon Ritchie
2286 Bowman Rd.
Ottawa, Ontario
Canada

TRUNKS FOR THE MEMORIES.

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CIRCLE 188 ON READER SERVICE CARD

Creative Computing Street Price Index

This is the first month of publishing the Creative Computing Street Price Index. It is intended to be an on-going monitor of the average price levels of selected computers, peripherals, video games and related accessories in the real-world marketplace. The list price is the price set by the manufacturer for the product when it was first announced, and is not necessarily the current manufacturer list price.

As time goes on, this Index will be presented in graphical form, but until there are six or seven data points, a graph would be of little value.

This Index is not intended to be a purchasing guide. Frequently, the lowest price for a computer will be offered by a vendor who is going out of business or closing out that particular item. Unless you are convinced you will never need service or are skillful enough to repair an unhealthy computer yourself, you would probably not want to buy a machine from such an outlet.

Furthermore, most of our price monitoring is done in major metropolitan areas on the two coasts. Prices outside of large cities and in the central part of the country are usually higher.

	Orig List	June 1983 ....Monthly.......				
Computer	**Price**	**High**	**Low**	**Average**	**Month Ago**	**Year Ago**
Apple IIe (64K, 40-col)	1395	1395	1175	1285	...	n/a
Atari 400, 16K	559	259	79(1)	178	179	352
Atari 800, 48K	999	549	369(1)	460	485	863
Atari 1200, 64K	899	679	424(1)	610	650	n/a
Commodore Vic-20	297	149	84	116	125	274
Commodore 64	599	399	289(1)	344	389	n/a
Osborne 1, 64K	1795	1795	1187	1492	1685	1895
Radio Shack:						
Color Comp, 16K	399	299	199	249	299	399
Model 4, 64K	999	999	999	999	n/a	n/a
TI 99/4A, 16K	635	269	98(1)	174	189	299
Timex 1000, 2K	99	65	34	46	55	149
Average home computer (up to 16K)	398	208	99	154	169	295
Line Printer						
Epson FX-80	699	695	565	630	n/a	n/a
Epson MX-80FT	745	505	429	467	467	567
NEC PC-8023A	795	499	435	467	467	599
Okidata 82A	799	459	380	420	439	549
Okidata 92	699	599	489	544	549	n/a
Star Gemini 10	449	399	339	369	375	n/a
Average 80-col dot matrix printer	697	526	439	482	459	572
Video Games						
Atari 2600	199	99	69(1)	84	99	149
Atari 5200	269	200	155	178	185	n/a
Colecovision	199	189	135	162	165	n/a
Intellivision II	199	150	79(1)	115	130	189
Average video game	216	145	109	127	145	169
Dynamic Memory Chips (200 ns, quantity 8)					...Lowest..	
16K x 1 bit (4116)	...	1.95	1.50	1.73	1.50	1.56
64K x 1 bit (4164)	...	7.49	5.95	6.72	...	n/a

(1) Includes a manufacturer rebate or equivalent

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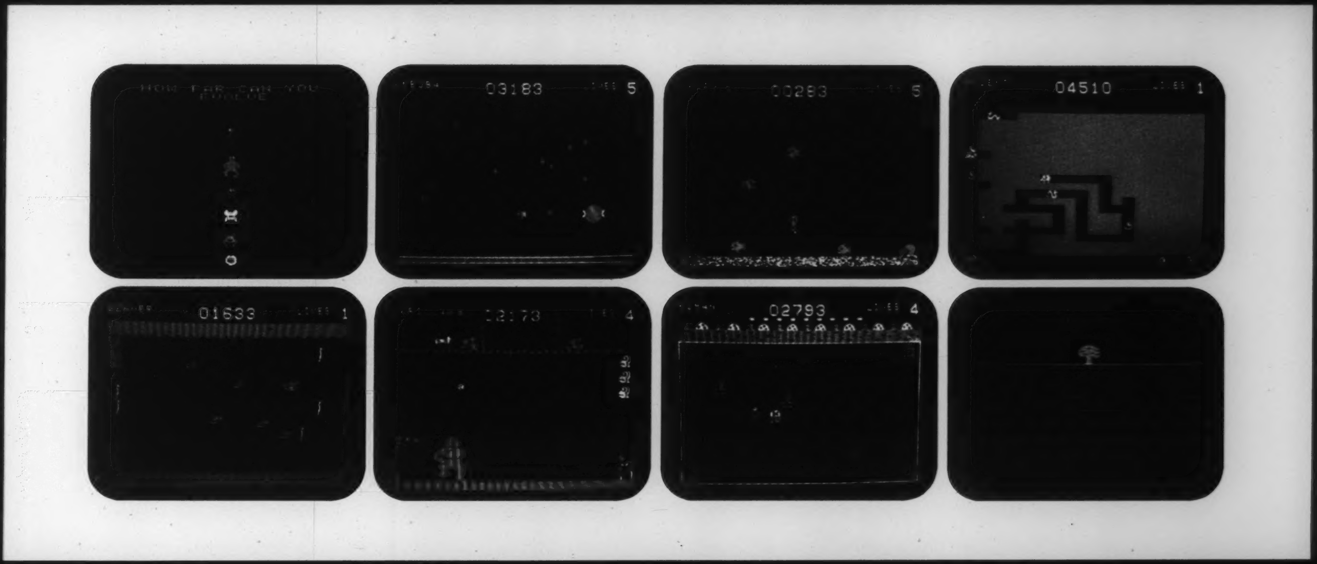

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- **You're a rodent chased by snakes while looking for cheese.**
- **You're a beaver attacked by alligators while building a dam.**
- **You're a gorilla protecting his food from monkeys.**
- **You're a man battling genetic mutants in an elastic background!**

Hailed by leading reviewers as one of the most exciting games available.
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Created by Don Mattrick and Jeff Sember.
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- Colorful high-resolution graphics
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- Arcade sound
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CIRCLE 286 ON READER SERVICE CARD

SPINNAKER'S LINE OF EARLY LEARNING GAMES IS GROWING AS FAST AS YOUR CHILD'S MIND.

Watching your kids grow up is a lot of fun. But making sure their minds grow as fast as their bodies is even more rewarding. That's where we can help. With a growing line of Early Learning Programs that are not only lots of fun to play, but also educational.

Some of the games you see on these two pages help exercise your child's creativity. Others help improve vocabulary and spelling skills. While others improve your child's writing and reading abilities. And all of them help your child understand how to use the computer.

So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with **Apple,® Atari,® IBM®** and **Commodore 64™** computers, but also with kids who like to have fun.

HEY DIDDLE DIDDLE
RUNS THROUGH THE TOWN
UPSTAIRS AND DOWNSTAIRS
IN HIS NIGHTGOWN
Unscramble the verses. Put together the nursery rhymes. And watch them come to life.
Ages 3-10
SPINNAKER™
We make learning fun.

HEY DIDDLE DIDDLE™ Poetry in motion. Ages 3 to 10.

Kids love rhymes.

And since HEY DIDDLE DIDDLE features 30 classic rhymes with full color graphics and the neatest computer music you've ever heard, it makes rhyme games more fun than ever before.

Plus, it makes it fun for kids to read, helps them understand how words and rhymes create poetry and lets them take fragmented thoughts and rearrange them to form coherent verse.

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RHYMES & RIDDLES
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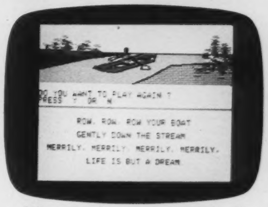
We make learning fun.

RHYMES & RIDDLES™ come to life. Ages 5 to 9.



DO YOU WANT TO PLAY AGAIN ?
PRESS Y OR N

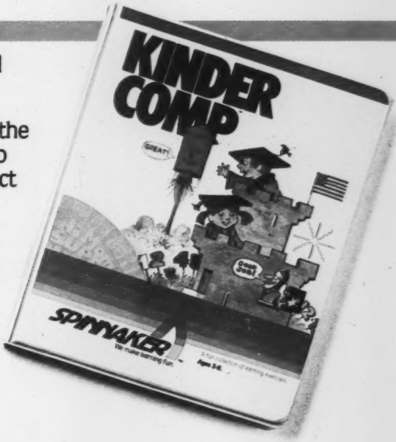
ROW, ROW, ROW YOUR BOAT
GENTLY DOWN THE STREAM
MERRILY, MERRILY, MERRILY, MERRILY,
LIFE IS BUT A DREAM

RHYMES & RIDDLES will delight your children. Because when they successfully complete the rhymes, riddles, and famous sayings on the screen, they'll see them come to life–with music and colorful pictures. And RHYMES & RIDDLES not only teaches children the correct lyrics to nursery rhymes and famous sayings. It also helps kids learn to read and spell while they're having fun! That's why parents like RHYMES & RIDDLES, too!

KINDERCOMP.™ Numbers, shapes, letters, words and drawings make fun. Ages 3 to 8.

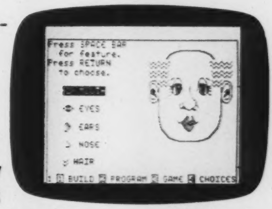
KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with colorful rewards, as the screen comes to life when correct answers are given.

As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.



FACEMAKER
SPINNAKER
We make learning fun.

FACEMAKER™ makes faces fun. Ages 4 to 12.



Press SPACE BAR for feature.
Press RETURN to choose.

FACEMAKER lets children create their own funny faces on the screen. Once a face is completed, your children will giggle with delight as they make it do all kinds of neat things: wink, smile, wiggle its ears, or whatever their imagination desires.

Plus, FACEMAKER helps children become comfortable with computer fundamentals such as: menus, cursors, the return key, the space bar, simple programs, and graphics. FACEMAKER won't make parents frown because their children will have fun making friends with the computer.

SPINNAKER™
We make learning fun.

CIRCLE 206 ON READER SERVICE CARD

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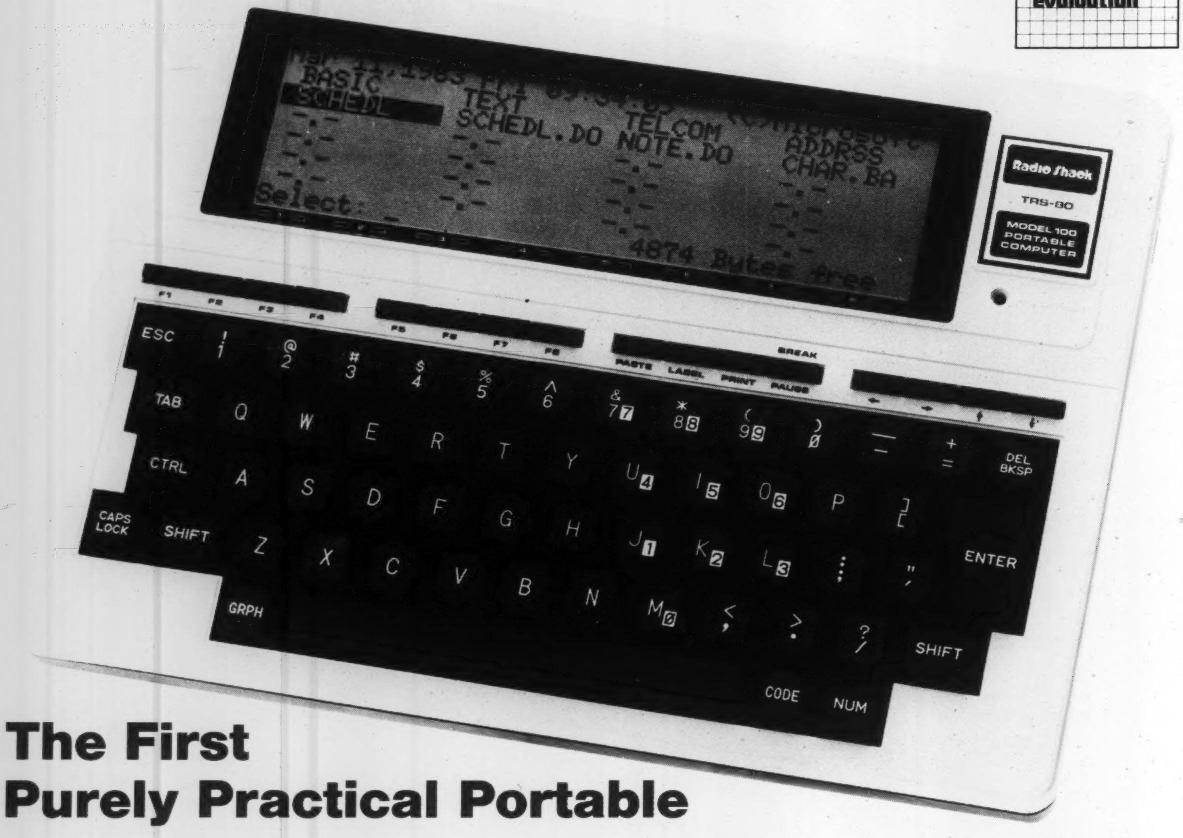
creative
computing
equipment
evaluation



The First Purely Practical Portable

John J. Anderson

After what could politely be called a lengthy hiatus in its tenure at the epicenter of the microcomputer universe, the old champ is back and looking fit as ever. When I first got my paws on it, I felt a twinge of excitement the likes of which I haven't felt since I bought my first machine. It felt good. Like Ali in Manila, Billy Martin, Motown, and the miniskirt, the TRS-80 is back.

The temptation is to say "back in a big way," and that is true, though in this incarnation the TRS-80 in question is the size of a three-ring looseleaf binder. As I reclined on the living room couch listening to records and using the Model 100 to begin this review, it dawned on me that I would never again want to be without such a machine. For the likes of me, the implications for dramatically bolstered productivity are mind-boggling. Word processing in bed, folks—imagine the possibilities.

But is it really a breakthrough? There has been quite a bit of brouhaha of late concerning the TRS-80 Model 100 computer, and you perhaps remain wary. Judging from the hype concerning the product, passed off as journalism by some other periodicals, you are hardly to be blamed. As I had a rather unique perspective on the introduction of the unit, I think it is fair to say that my hearty enthusiasm is tempered by a healthy objectivity. And yet the coming impact of the machine (safely assuming that prices will quickly fall) should not be underestimated.

The story of the Model 100 is not really the story of a TRS-80 at all.

The story of this TRS-80 is not like the story of any TRS-80 that has come before. And just as the introduction of the Model I was a pivotal industry story of the '70s, it is highly likely that the introduction of the Model 100 will be a pivotal industry story for the '80s. But why?

This is a riddle currently being posed by at least half a dozen other manufacturers even as you read this piece. A good answer requires a bit of background, just as it requires a good bit of respect for the designers of the machine.

The Origin Of The Species

First off, we must acknowledge that "TRS-80" is a trademark that Radio Shack liberally sprinkles like fairy dust on every computer it produces. The moniker is no longer used to label the microprocessor residing within a certain machine, but to add reputation, visibil-

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You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software—including programs that plot directly from VisiCalc* and Supercalc** files—is now available.

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The Strobe Graphics System

Seeing is believing

CIRCLE 262 ON READER SERVICE CARD

*VisiCalc is a trademark of VisiCorp.

**Supercalc is a trademark of Sorcim Corp.

ity, and a brand-name to otherwise unknown and untried products. I imagine we will have to wait at least another decade or so before Tandy works up the courage to give one of its computers another name.

So the story of the Model 100 is not really the story of a TRS-80 at all. That, too, is a revelation largely neglected by other publications: that this TRS-80 is an import. Another magazine (which shall remain nameless) went so far as to ask Tandy about the philosophy underlying the choice of the 80C85 CPU for the unit. A PR spokesman rushed to answer with sophistic relish, as if Radio Shack had been actively involved in the choice.

The fact is that the 80C85 was chosen by Kyoto Ceramics (Kyocera), the Japanese designers and builders of the original machine. They sold it to NEC for distribution in Japan, and NEC in turn licensed it to Tandy for distribution here and worldwide (though NEC is in no way enjoined from introducing its own machine). The philosophy emanating from Fort Worth was not very much more than "let's go with that one."

Not to imply the pejorative in any way. On the contrary, the Model 100 is to my mind the best move we have seen from Radio Shack in at least three years. It is one bound to make its stockholders, who have recently been a bit edgy, as well as Model 100 owners, very happy. The TRS-80 name has leapt right back into the middle of the action.

But the record should for the sake of accuracy be set straight on the point of origin of the Model 100.

About a month ago I was visited by a very nice fellow by the name of Tom Priestly from NEC Electronics USA. He showed me a very interesting new portable computer from Japan: the NEC PC-8201. I was very impressed with it. It looked like a portable that really had the potential to go places.

"Finally," I said to him, "a lap machine with a full-stroke keyboard, substantial memory, and a generous LCD (liquid-crystal diode) screen display." And with built-in Basic, word processing, and database software, it wouldn't have to fight the uphill software battle that has often mired Japanese hardware in the American market. My fervent advice to Tom: load them up for shipment to the states as soon as possible.

He said that while no firm plans had been made to bring the machine to this country, NEC was testing the waters, sending up a trial balloon, running it up the flagpole to see if anyone salutes, so to speak. I saluted. With glazed eyes, I murmured that they would be utterly nuts not to start piling units into the next available boat, if not sooner. He only smiled. Little did I know.

Imagine my surprise, when two days later, the chief (DHA, the boss man, the big cheese) stopped in to tell me Radio Shack had announced its Model 100. I then realized just how far the NEC 8201 had already managed to go. It had made the metamorphosis into the Radio Shack TRS-80 Model 100 in the blink of an eye.

But let's give some credit to Tandy, for surely the whole plot was hatched a while back. There are some substantial differences, you see, between the machine that Tom showed me and the Model 100 that appeared at the lab. And while the 100 has features missing from the Japanese "notebook" machine, not all changes resolve in favor of the Radio Shack machine (see the sidebar).

One of the manufacturers that must be slapping its forehead hard right about now is Epson, the Japanese maker of one of the most popular microcomputer printers in the world, the MX-80. Many

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*Patents pending, UL listed, FCC approved, 240V/50 Hz version available. Dealers and OEM inquiries invited.

CIRCLE 282 ON READER SERVICE CARD

American industry analysts looked to Epson to make the first substantial Japanese microcomputer inroads in the US, with machines like the HX-20 and QX-10. Epson itself feverishly hoped to heat up the portable market with the introduction of the HX-20, and proceeded to back up that hope with an aggressive media blitz unrivaled by any Japanese competitor.

There on NBC, the back page of the *New York Times,* and the centerfold of *Newsweek,* was superior person A, with his trim, marvellously miniaturized HX-20, smirking as he watched silly person B, pitifully dropping component by component of his Apple system onto the college clasroom floor—a brilliant campaign, largely responsible for introducing people to the very notion of the portable.

And yet somehow the market never materialized. The reasons are twofold, and not too difficult to fathom, except perhaps for Epson. First, the liquid crystal display of the machine was limited to four rows of 20 columns. Even as people marvelled at the size of the product, you could detect a look of claustrophobia in their eyes. At that size, a single business address label could just about fit on the screen, if you were lucky.

Japanese machines tend to curl up and die on our shores for the simple lack of software to run.

The second reason is potently endemic to Japanese machines. They tend to curl up and die on our shores for the simple lack of software to run. The HX-20 became just another pretty machine to bring home and look at, and hope for the future. As for me, well, give me an Apple with a roomy carrying case.

The HX-20 had nevertheless given life to some very innovative ideas. It showed that a portable could sport a life-size, full-stroke keyboard, on which touch-typing could take place, without sacrificing very much in the way of size. It dared to link a full-fledged 32K computer with an LCD display. And it created a new species of micro: smaller than the Osbornesque sewing machine case with a CRT, yet bigger than a handheld, of the kind usually giving rise to user thoughts of wrists the size of hamhocks or of sharpening fingertips in pencil sharpeners (for a further expose on the so-called "Chiclet Syndrome," see my review of the Tymshare Scanset in the December 1982 *Creative*).

Showing their true professionalism, a plethora of other companies have lately rushed into the fray with their own HX-20 clones, true to the original in both crucial aspects, namely an inadequate display and no practical software. These concerns include respected American names like Texas Instruments, which chose with its CC-40 to narrow the display to a *single* line and reduce the keyboard to standard handheld "chiclet" style. And despite the gelatinous protests of Bill Cosby, the stark commonality of these machines is that they are all going to be DOA—for those who don't watch *Quincy,* that means "dead-on-arrival." This goes even for some machines as yet unreleased (one might coin the acronym "DBA," or lamentably "dead-before-arrival"). But the Model 100 has changed all that.

Truly Portable

At 12″ × 8½″ × 2″ and 3½ lbs, the

NO POWER SPIKES WITH SUPER FAN II.

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Available in 240V/50 Hz.

Dealer/OEM inquiries invited.
*U.S. Patent #D268283
#4383286

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CIRCLE 237 ON READER SERVICE CARD

Model 100 is about as portable as you can get. The first thing you notice about it is the size of its liquid crystal display. It is eight lines of a full 40 columns, using nicely-sized and highly legible characters in a window of 7½" × 2". If you use dot-addressable graphics, you may access a matrix of 240 × 64 pixels. That is quite enough to accommodate most of a paragraph. I'm sure that as manufacturers become less bashful concerning large LCD displays, we shall see them at twice and even three times that size, but for starters, it is positively huge. It is certainly adequate for on-the-go text editing, which is an application in which I am intensely interested.

Let me put in a good word for lines as opposed to columns. I would much rather have eight lines of 40 characters, as the 100 provides, than one, two, or three lines of 80 characters. It is simply easier to read text in that format. Remember, the width of a typical newspaper column is 35 characters. The direction of growth that I would most like to encourage is in the number of *lines* a machine offers. How about 16, 24, or 32? Where to fit this sizable screen, you ask? Why in the hinging lid, of course.

The Keyboard

Probably the next thing you'll notice about the TRS-80 Model 100 is its no-nonsense full-stroke keyboard, utterly free of keybounce and unorthodox key placement. It is ready for quick and painless touch typing. A closer look reveals eight programmable function keys with corresponding label functions displayed at the bottom of the LCD window. Dedicated function keys are devoted to functions called print, label, paste, and pause. Print does just that—to any parallel printer if you have a connecting cable. Label selects and deselects the naming of function key functions at the bottom of the LCD window. Paste is the block insert function used by the text editor. And pause is an extremely handy key which allows program execution to be frozen without a BREAK. Press it again to resume from exactly where you left off.

The cursor movement keys are arranged in linear format, which is a bit troublesome.

In addition to these and the IBM Selectric-style keyboard, there are keys labelled NUM, GRPH, and CAPS LOCK. NUM is a detent key that tranforms the keys U, I, O, J, K, L, and M into a numeric keypad along with the standard QWERTY 7, 8, and 9, quite like that on any adding machine, though on somewhat of a slant (see photo). Using GRPH, all *256* characters the Model 100 is capable of producing can be accessed from the keyboard, which is a unique capability.

The cursor movement keys are arranged in linear format, which is a bit troublesome (one of the places where the Japanese model wins out). But, with a bit of practice, you can get used to working with them.

Now that we have taken a quick look at the business end of the Model 100, let's snoop around the sides and back of the machine.

Modem And Bar Code Reader

Starting clockwise on the lefthand side, we first encounter the originate/answer toggle switch. This is used to select the operation parameters of the built-in modem. Just left of that is another switch that tells the computer whether it is using an acoustic coupler or direct-connect to the phone lines (more about telecommunications potential up ahead).

Next to the toggles and hidden under a little plastic hatch is the male DB-9 connector for a bar-code reader. Yep folks, you read me right. The Model 100 will read bar code, if you supply the wand (Hewlett-Packard HEDS-3000 compatible) and the software. I am quite convinced that bar code will find a place in the microcomputer community, though it will be a while. It is the only *print* medium with anything approaching a respectable baud rate for data transfer.

Wondering what the big deal is about those zebra stripes you see even on the cover of magazines like this one? Well imagine waving the bar code reader of your micro over a page of the magazine, and entering a complex, error-free program in seconds, as opposed to spending tedious hours copying and debugging listings by hand, only to give up in despair. I figure my own rate at that occupation to be about 10 or 12 baud, with errors. Yeow. I hold out the hope that someday *Creative Computing* will carry bar coded program listings, and I see the bar code reader port on the side of the Model 100 as a step in the right direction.

Continuing around to the rear, we see twin DIN sockets for connection to cassette recorder and modem cables. They use different pin configurations, so it is impossible to plug a cable into the wrong socket. I also foresee another use for the cassette socket, which I will describe below.

Printer Interface

Left of these is the parallel printer interface. Using an inexpensive custom cable from Radio Shack, the Model 100 will drive any Centronics compatible printer directly.

As far as I am concerned, this is a much more logical approach to obtaining hard copy from a portable than a built-in impact printer, which uses loads of juice, draining precious battery charge, and adds weight and bulk. What's more, for most users, a print-out the size of a cash register tape is of limited use. Chances are that the Model 100 will be a second computer and that most users will have access to at least one printer. Certainly in the near future, printers will be available at almost any business destination, and a lifesize print-out can then be output in seconds. It makes more sense to keep the printer outboard.

It makes more sense to keep the printer outboard.

Moving left of the printer interface we find the RS-232C serial interface. This jack makes hooking the Model 100 to another computer a relatively simple task. A standard issue female DB-25 is offered, meaning that you may already have the necessary cable on your existing desktop micro. Match up your configurations, and you're rolling.

Reset

At the extreme left of the back side is the reset button, recessed under the plastic cowling of the machine to avoid accidental engagement. A push of the button will invoke a warm start, which will nearly always get you out of whatever trouble has prompted you to push it in the first place. In the rare instance that you are still locked up after a warm reset, you will have to initiate a cold start by holding reset while powering down, then up. Or you can press CONTROL-PAUSE while holding the reset button. And zap: this action will induce instant amnesia in your machine. It will forget all it ever knew.

We have now rounded to the right side of the Model 100, where the on-off switch, AC adapter socket, and LCD adjust dial are located. Not much to say here, except that the LCD adjust dial allows the user to adjust the angle of

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CIRCLE 211 ON READER SERVICE CARD

reflection of the liquid crystal display for good visibility from whatever position he is in. Critics of LCDs take note: really the only problem with them is that they are like Fresnel traffic light lenses—highly directional. This adjustability feature alleviates the problem completely.

Bottom's Up

Now let's look at the flip side. The prominent feature here is the battery compartment, holding four AA alkaline penlight batteries. They will last about 20 hours per set. Also on the belly of the beast is a toggle switch to the rechargeable nickel-cadmium batteries that keep the CMOS RAM intact. If the unit will not be used over a long period of time (highly doubtful), the documentation advises flipping off the switch to preserve the ni-cads. This will, of course, flush all contents just like a cold start.

Even with heavy use, the batteries should recharge themselves from AC satisfactorily over a period of two or three years. To preserve memory contents, you may save all the data to storage media or another computer before storage or a battery change. Then you can reload the data at a later date.

The final, and most mysterious, aspect of the underside is the black hatch cover that calls for a coin to pry it open. Inside lies a ROM socket and a 40-pin expansion bus. All Radio Shack has said is that it plans 32K ROM application programs for the ROM slot. As for the expansion bus, mum's the word. Clearly that would be the place, we may conjecture, to connect a disk drive or patch the machine to a bona fide CRT screen.

Unseen but inside is the complementary metal oxide semiconductor RAM, available in sizes ranging from 8 to 32K. Then there is the CMOS ROM, of which there is 32K on a *single chip.* This was quite a feat. They both address the 80C85 microprocessor, which is architecturally very much like your run-of-the-mill 8085, CMOS-style.

Power Up

Let's switch the thing on. We are immediately greeted by the ROM-based menu program (see photo). Across the top line we read the date, day, and time in 24 hour format. Next comes a list of all the programs and files available in the machine. The cursor movement keys and spacebar allow the user to flip through the files until the desired one is highlighted. The program or file can then be selected by pressing ENTER. Or, if you choose to do so, you can enter your file of choice by name.

19582 Bytes free

Menu runs upon power-up.

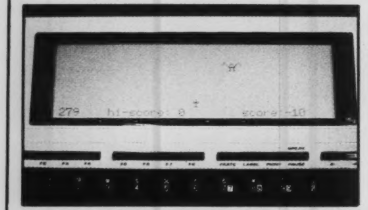
In addition to whatever files you construct, five ROM-based programs will always be available to you: Basic, Text, Telcom, Addrss, and Schedl. As these programs reside simultaneously in ROM, as do data files in RAM, the Model 100 reaches a surprisingly high level of integration.

"Integration" is in microcomputing a term usually invoked when talking of high-end machines. For example, software for the Apple Lisa is highly integrated. It simply means that one piece of software can use information directly from another piece or move directly to a new function, as if you were using more than one computer.

We shall take a closer look at each of the software components built in to the Model 100, in what should *not* be construed as order of importance.

Games on the Model 100: LCD-Fender

Forty columns by eight rows is more than ample room for somewhat advanced graphics applications. The program LCD-Fender, for example, is an Invaders-type game that captures much of the excitement of a CRT-based game, only in miniaturized form. If you take the time to type in the listing and study the game, you will learn quite a lot about graphics on the Model 100. The game is also a heck of a lot of fun to play.



Every machine deserves its own space shoot 'em up.

A cassette-based Invaders game included with the NEC 8201 uses the left and right cursor keys for movement. I used it as the starting point for this game but soon discovered that the left and right cursor keys on the 100 were not nearly fast enough for "twitch" style gaming, and so moved directional input to the < and > keys.

Blast aliens out of the sky using the spacebar. Be accurate: every miss costs points and brings the alien a level closer. A direct hit gains you 100 points. "Winging" is worth 50. When only 50 time units are left, the game will warn you. Your player has full screen wrap-around.

Needless to say, although the game has a few sophisticated features, this is just a beginning, a starting point for graphics games on the Model 100. Next week, Pac-Man! —JJA

```
1 REM LCD-Fender by John Anderson
10 DEFINT A-Z
15 FOR X=1 TO 10:I$=INKEY$:NEXT
20 CLS:SC=0:PRINT" LCD-Fender"
30 PRINT:PRINT" Press <SPACEBAR> to play
:":PRINT:PRINT" Press <I> for instructio
ns:"
35 PRINT:PRINT" Press <M> for menu."
40 I$=INKEY$:IF I$=" " THEN 60
50 IF I$="M" OR I$="m" THEN MENU
52 IF I$="I" OR I$="i" THEN 510
55 GOTO 40
60 M=20:SCREEN 0,0:CLS:T=350
70 R=0:X=RND(1)*35+1
80 T=T-1:PRINT@X+R," ^Ω^ ";
90 I$=INKEY$
100 IF I$="." THEN M=M+1
110 IF I$="," THEN M=M-1
120 IF I$=" "THEN GOSUB 230
130 IF T<0 THEN 460
140 IF M<0 THEN M=39:PRINT@6*40,"   ";
150 IF M>39 THEN M=0:PRINT@39+(6*40),"
";
160 PRINT@M-1+(6*40)," ♣ ";
170 PRINT@(7*40),T;"   hi-score:";HS;
180 PRINT@27+(7*40),"score:";SC;
190 P=RND(1)*4-1:S=RND(1)*2
192 IF S=1 THEN P=-P
194 X=X+P
200 IF X<1 THEN X=1
210 IF X>35 THEN X=35
215 IF T<50 THEN SOUND 4000,1
220 GOTO 80
230 REM
240 FOR Y=5 TO 0 STEP -1
250 PRINT@M+(Y*40),"↑"
260 SOUND Y*1000,1
270 PRINT@M+(Y*40)," "
280 NEXT
290 IF M=X+2 OR M=X+4 THEN SC=SC+50:BEEP
:GOSUB 330:GOTO 70
300 IF M=X+3 THEN GOTO 390
305 PRINT@X+R,"       ":R=R+40:SC=SC-5
307 IF R>200 THEN SC=SC-10:GOTO70
310 RETURN
320 REM assorted subroutines
330 FOR I=0 TO 10
340 PRINT@X+1+R,"BLORK!"
350 FOR J=0 TO 20:NEXT:PRINT@X+1+R,"
   "
360 SOUND 16000,1:NEXT
370 GOTO 70
380 REM
390 SC=SC+100:SOUND 440,10
400 FOR I=0 TO 10
410 PRINT@X+1+R,"WAAGH!"
420 SOUND 1760,1
430 NEXT I
440 PRINT@X+1+R,"      "
450 GOTO 70
460 IF SC>HS THEN HS=SC
470 PRINT@175,"GAME OVER":LINE (0,0)-(23
9,63),1,BF
475 PRINT@125," score:";SC;"hi-score:";H
S;
500 FOR X=1 TO 4000:NEXT:GOTO 15
510 CLS:PRINT" Use < to move left, > to
move right,":PRINT" and the spacebar to
fire."
520 PRINT:PRINT" DIRECT HIT=100  WING=50
"
530 PRINT" Penalties for letting aliens
descend.
540 PRINT:PRINT" Good luck! Hit <SPACEBA
R> to begin:"
550 I$=INKEY$:IF I$=" " THEN 60
560 GOTO 550
```

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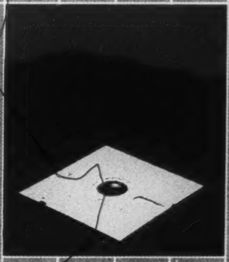

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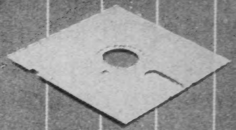

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Text

Radio Shack avoids using the term word processing to describe the text editor made available by the Text program. It does, in fact, lack many of the features available on bigger machines. But it really should be judged on what it *does* do rather than on what it does not do. What it does do is present an environment wherein words and programs can be processed quite efficiently—without muss or fuss, as I like to say—while leaving user RAM entirely to file storage.

While it does not offer a "search and replace" feature, and its limited "find" function terminates at the first occurrence of any designated string, Text does allow block move, copy, and delete functions. While its manner of storage creates a ragged left screen margin on lines with leading spaces, special movement commands nevertheless make scrolling through a document a breeze.

The Basic onboard the TRS-80 Model 100 is as powerful as that of its desktop counterparts.

Inserting new text into existing text is slow, but a generous type-ahead buffer is provided. And while you cannot set the left margin on a direct printout anywhere but adjacent to the lefthand perforations, nor can you set pagebreaks, you *can* designate column width (up to 132 columns).

I have pumped about 90K or so of text into (and out of) the Model 100 by now, and have grown very accustomed to its mode of operation. While it is admittedly a "bare-bones" editor, it is very fair to say that those bones are resilient and smoothly-hinged. Editing text presents little problem, especially if like me, you will ultimately be uploading files elsewhere for final processing.

Telcom

Next we have Telcom, the communications program that allows the Model 100 to communicate with the outside world. Without Telcom, word processing on the Model 100 would be of little use to me.

First I attach an RS-232C cable from the serial card in my Apple II to the RS-232 port on the 100. Then I run Telcom on the TRS-80, making sure to set the configuration to match the card and terminal program I have run on the Apple, and I'm in business.

I can download, upload, or type directly in either direction from one machine to the other. Of course my primary interest is uploading from the TRS-80: I store the uploads as Apple text files, which are then directly accessible from my Apple word processor. It is this capability that to my purposes makes the Model 100 a practical and desirable tool.

But the 300 baud inboard direct-connect modem in the Model 100 takes things a giant step further. By connecting a modular phone and line with a special cable to the Model 100, you can join the world of telecommunications: bulletin boards, networks, mainframes, and other micros. I "called" my Atari on the phone, and easily transferred files. Who would have thought the TRS-80 would have so effectively invaded my sheltered, 6502 processor-dominated world?

If you do not ordinarily have access to a modular telephone, you may purchase the acoustic coupler option that has cups that slip over the phone handset. This makes any hotel phone or telephone booth into a potential telecommunications tool.

And we've only begun. The built-in modem can also *dial* your phone for you, whether or not you are placing a telecommunications call. If you are, it can automatically transmit special passwords and log-on sequences. If you are not, just pick up the phone. And that is that.

I'll bet you are beginning to get the idea now.

Addrss

Allow me to continue with Addrss. This is a mini-database program, which you can structure in any way you wish. Then, by instituting a string search, you can recall any file of any length, as long as it is separated by carriage returns from other files.

If you enclose the phone number in colons, it can be auto-dialed directly from the Telcom program. This is the kind of integrated capability I alluded to above when I went so far as to invoke the name of Lisa in our discussion. As mentioned above, log-on sequences can be stored here too, for direct transmission at the time of connection.

Schedl

Schedl is a very similar program, though without telecommunications integration. It allows you to construct a second and wholly separate database, and the suggestion is to use it to keep an appointment calendar. Like Addrss, it is a string-based search program, and so can be used to organize any data you like.

Then there is Microsoft Basic.

Basic

When Dave visited Microsoft in Japan last week, they told him that all 8-bit processor work now emanates from Japan, leaving the U.S. component of Microsoft free to concentrate on 16-bit machines. Well, the Japanese division has been hard at work.

The Basic onboard the TRS-80 Model 100 is as powerful as that of its desktop counterparts, PEEK for PEEK, POKE for POKE, and CALL for CALL. As far as I can tell, it should also be quite portable. The 80C85 is in the Z80 family, after all, and so a fair amount of compatibility with other TRS-80 Basics should come as no surprise.

But there are a few surprises in Model 100 Basic. First of all, any Basic file will autorun if selected from the main menu program. The command MENU will return to the menu program at the conclusion of a Basic program run, if desired.

Basic can also access data in other programs or data files, again in a highly integrated manner. You could write enhancements to the text editor in Basic, for example, and use it to overcome the inadequacies of the print function from Text (namely, setting a left margin and page breaks). You could write complex

Introducing the RAM Cartridge

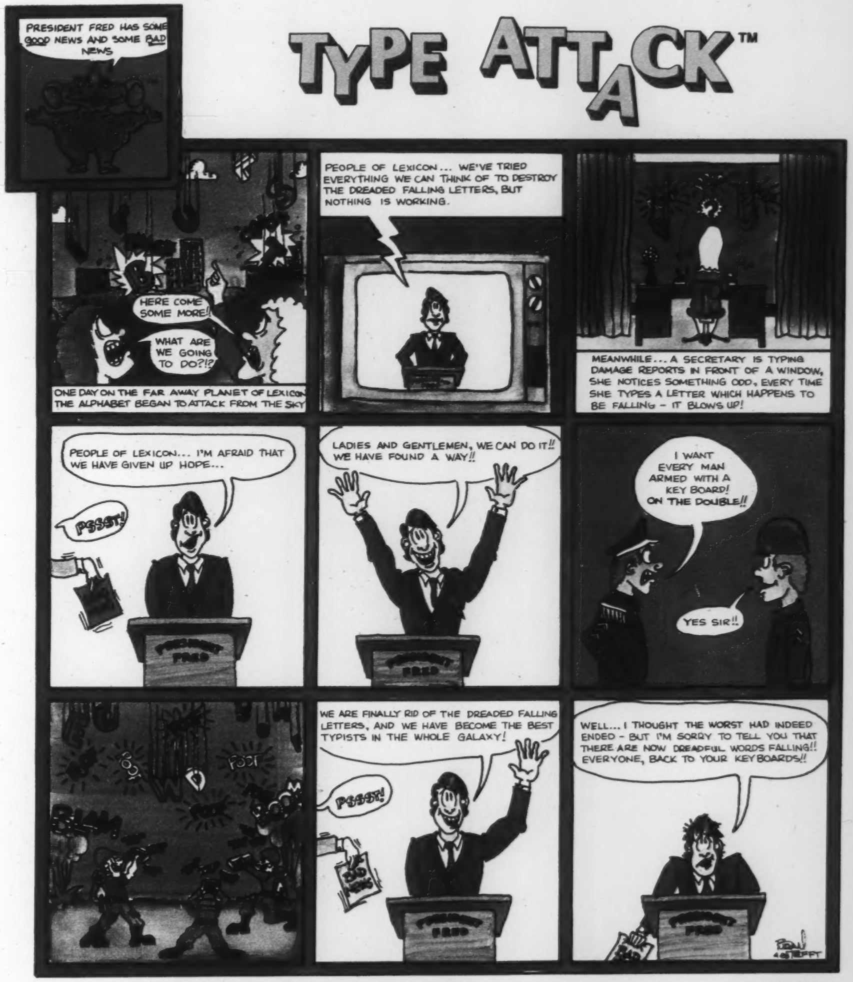
One of the more provocative features of the NEC notebook machine fits in the cartridge slot on the lefthand side of the unit. In addition to 32K ROM-based applications, a 32K CMOS RAM cartridge can be plugged into that slot.

Powered by its own mercury batteries, the RAM cartridge is utterly nonvolatile. That is to say, any or all internal RAM contents of the portable computer can be uploaded to a RAM cartridge and stored there for good lengths of time. This would in turn free RAM in the portable machine for further use.

With three or four RAM cartridges in your briefcase, you would have all the storage capacity of a fully-configured desktop computer, without the need for disk drives. Need another 32K? Just get a hold of another cartridge.

The CMOS RAM cartridge most definitely has a promising future in the portable microcomputer world. And although the Model 100 does not sport a cartridge slot, as does its cousin the NEC, the capability could most certainly be added to the machine through the expansion bus. We surely hope Tandy will exploit this possibility.

TYPE ATTACK™


PRESIDENT FRED HAS SOME GOOD NEWS AND SOME BAD NEWS
HERE COME SOME MORE!!
WHAT ARE WE GOING TO DO?!?
ONE DAY ON THE FAR AWAY PLANET OF LEXICON THE ALPHABET BEGAN TO ATTACK FROM THE SKY
PEOPLE OF LEXICON... WE'VE TRIED EVERYTHING WE CAN THINK OF TO DESTROY THE DREADED FALLING LETTERS, BUT NOTHING IS WORKING.
MEANWHILE... A SECRETARY IS TYPING DAMAGE REPORTS IN FRONT OF A WINDOW, SHE NOTICES SOMETHING ODD, EVERY TIME SHE TYPES A LETTER WHICH HAPPENS TO BE FALLING - IT BLOWS UP!
PEOPLE OF LEXICON... I'M AFRAID THAT WE HAVE GIVEN UP HOPE...
PSSST!
LADIES AND GENTLEMEN, WE CAN DO IT!! WE HAVE FOUND A WAY!!
I WANT EVERY MAN ARMED WITH A KEY BOARD! ON THE DOUBLE!!
YES SIR!!
POOF
BLAM
WE ARE FINALLY RID OF THE DREADED FALLING LETTERS, AND WE HAVE BECOME THE BEST TYPISTS IN THE WHOLE GALAXY!
PSSST!
BAD NEWS
WELL... I THOUGHT THE WORST HAD INDEED ENDED - BUT I'M SORRY TO TELL YOU THAT THERE ARE NOW DREADFUL WORDS FALLING!! EVERYONE, BACK TO YOUR KEYBOARDS!!
PRESIDENT FRED

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Game design by Ernie Brock and Jim Hauser.

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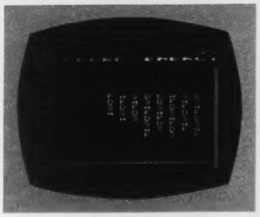

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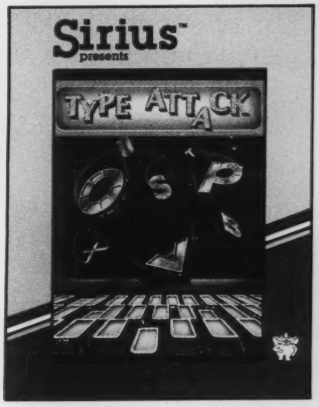
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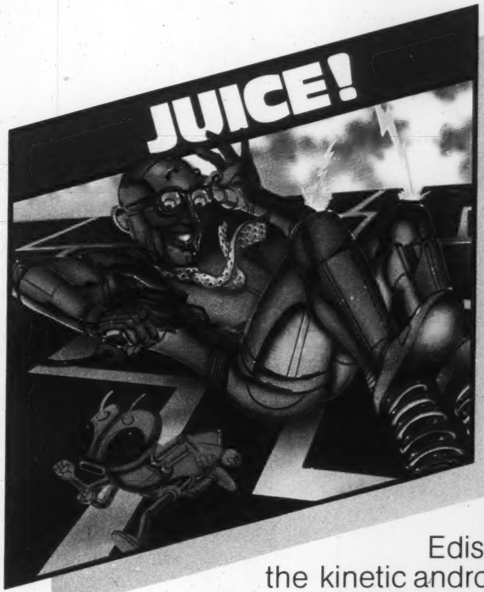
Electronic Games calls the Kid "Hypnotic, appealing, fast-moving arcade action of the highest calibre, ...one of the most compulsive, utterly addictive contests in the world of computer gaming."

We couldn't agree more.

What will the critics say about *Juice!*? Will they like its colorful graphics, superior sound effects, charming characters and challenging play patterns?

Why wait around to find out?



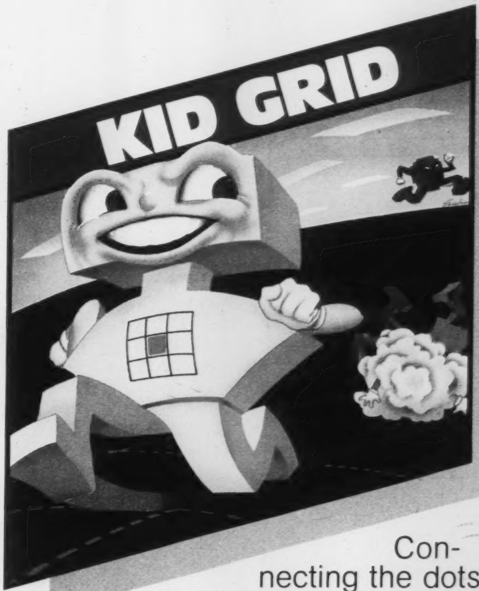
Edison, the kinetic android, leads a frustrating life.

All he wants to do is build his circuit boards and go with the flow. But things keep getting in the way.

Nohms—a negative influence—bug him constantly. Flash, the lightning dolt, disconnects everything in his path.

And the cunning Killerwatt is out to fry poor Edison's brains.

You'll get a charge out of this one. And a few jolts, too!
(Requires 32K memory. Suggested retail $29.95)



Connecting the dots on our colorful grid should be easy, right?

Wrong. Because the bullies are in hot pursuit!

Squashface, Thuggy, Muggy and Moose are their names. And *you* are their game. And what's more, they're faster than you are.

But you're smarter. And you control the stun button.

So keep your eyes peeled for the mysterious question mark and don't slow down at corners!
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CIRCLE 222 ON READER SERVICE CARD

telecommunications applications that interface with Telcom. Or you could search data files.

Using the command IPL, you can change the warm start autorun file from the ROM-based menu program to any program of your choice. I have used it to create a rudimentary password-protection system on my machine. If the user does not enter the correct password after power on, the unit admonishes him, and then, with the simple Basic command POWER OFF, turns itself back off. (Until I find the POKE that disables the BREAK key, this won't be a totally effective failsafe.)

Decimal	Hex	Binary	Printed Character	Keyboard Character
144	90	10010000	⛫	GRPH y
145	91	10010001	🚘	GRPH u
146	92	10010010	↕	GRPH ;
147	93	10010011	웃	GRPH q
148	94	10010100	웃	GRPH w
149	95	10010101	♂	GRPH b
150	96	10010110	♀	GRPH n
151	97	10010111	℅	GRPH .
152	98	10011000	↑	GRPH o
153	99	10011001	↓	GRPH ,
154	9A	10011010	→	GRPH l
155	9B	10011011	←	GRPH k
156	9C	10011100	♧	GRPH 2
157	9D	10011101	♢	GRPH 3
158	9E	10011110	♡	GRPH 4
159	9F	10011111	♤	GRPH 5
160	A0	10100000	·	CODE '
161	A1	10100001	à	CODE x
162	A2	10100010	ç	CODE c
163	A3	10100011	£	GRPH 8
164	A4	10100100		CODE "
165	A5	10100101	µ	CODE M
166	A6	10100110	÷	CODE)
167	A7	10100111	▼	CODE _
168	A8	10101000	†	CODE +
169	A9	10101001	⚷	CODE s
170	AA	10101010	🅁	CODE R
171	AB	10101011	🄲	CODE C
172	AC	10101100	¼	CODE p
173	AD	10101101	¾	CODE ;
174	AE	10101110	½	CODE /
175	AF	10101111	‹	CODE 0
176	B0	10110000	¥	GRPH 7
177	B1	10110001	Ä	CODE A
178	B2	10110010	Ö	CODE O
179	B3	10110011	Ü	CODE U
180	B4	10110100	c	GRPH 6
181	B5	10110101	-	CODE [
182	B6	10110110	ä	CODE a
183	B7	10110111	ö	CODE o
184	B8	10111000	ü	CODE u
185	B9	10111001	ß	CODE S
186	BA	10111010	™	CODE T
187	BB	10111011	é	CODE d
188	BC	10111100	ù	CODE .
189	BD	10111101	è	CODE v
190	BE	10111110		CODE =
191	BF	10111111	£	CODE F
192	C0	11000000	â	CODE l
193	CI	11000001	ê	CODE 3
128	80	10000000	☎	GRPH p
129	81	10000001	🏠	GRPH m
130	82	10000010	(×	GRPH f
131	83	10000011	⊏	GRPH x
132	84	10000100	✣	GRPH c
133	85	10000101	✈	GRPH a
134	86	10000110	🏠	GRPH h
135	87	10000111	▣	GRPH t
136	88	10001000	i	GRPH l
137	89	10001001	\	GRPH r
138	8A	10001010	≠	GRPH /
139	8B	10001011	Σ	GRPH s
140	8C	10001100	≈	GRPH '
141	8D	10001101	±	GRPH =
142	BE	10001110	∫	GRPH i
143	BF	10001111	◀	GRPH e

Figure 1. Just some of the 256 special characters available from the Keyboard. Custom sets are also possible.

There is even a command called ERROR, which allows you to "simulate" an error condition. Why in heaven's name anyone would want to do this is quite beyond me at the moment, but the potential is nonetheless there.

The only command I found to be missing is a LOCATE or POSITION command to set the cursor at a specific point on the screen using x and y arguments. I was surprised at the omission, especially in light of the fact that the NEC machine *does* include the command LOCATE in its Basic repertoire. There is a command called POS in Model 100 Basic, but all it does is *return* the current cursor position. The only alternative is to use the PRINT @ command, along with the fomula x + (Y*40) to convert screen position to a single argument format. This is a pain.

The graphic command LINE allows lines to be drawn on the screen. Modifications to the LINE command change input values from the end points of plotted lines to the diagonal corners of a rectangle or square. A further modification allows the boxes to be "filled in." These commands, along with the 256 characters available, give the Model 100 surprisingly sophisticated graphics capabilities (see Figure 1). If *only* there were a LOCATE command . . .

And as if that were not enough, the TRS-80 can make sounds. And it can do more than just BEEP, though that is one of the Basic commands available. Using SOUND command values, the 100 can play music at various tempi over a single-voice range of five octaves (see Figure 2).

Another snafu with Model 100 Basic is editing. The NEC machine has full cursor movement and editing features available from the Basic execution mode. Not so with the Model 100. The Basic file you wish to modify must be brought into Text environment with the EDIT command to evoke editing capabilities. With short files this is a minor annoyance. A quick hit of function key 8 and you are again ready to run the file.

Graphics using line and box commands.

But with a long program, it can take upwards of two minutes for the 100 to

Continued on page 32.

SOUND *pitch, length*

SOUND "plays" a given pitch for the given length. *length* ranges from 0 to 255. Dividing length by 50 gives the approximate length in seconds. *pitch* ranges from 0 to 16383, with the larger values corresponding to higher pitches. The values of *pitch* corresponding to musical notes are shown below.

	Octave				
Note	**1**	**2**	**3**	**4**	**5**
G	12538	6269	3134	1567	783
G#	11836	5918	2959	1479	739
A	11172	5586	2793	1396	698
A#	10544	5272	2636	1318	659
B	9952	4976	2484	1244	622
C	9394	4697	2348	1174	587
C#	8866	4433	2216	1108	554
D	8368	4184	2092	1046	523
D#	7900	3728	1975	987	493
E	7456	3718	1864	932	466
F	7032	3516	1758	879	439
F#	6642	3321	1660	830	415

Figure 2. Five-octaves of single-voice sound.

NOAH WEBSTER, MEET YOUR MATCH.

A few months ago, Jennifer would rather have gone to the dentist than do her spelling homework.

Then Mom bought Crypto Cube™ by DesignWare.™ Now Jennifer has become a word fiend. In fact, she spends hours paging through the dictionary to find words that will stump her parents. And, as she does, she builds her word skills.

Crypto Cube, like all DesignWare software products, combine computer game fun with sound educational principles.

THE THREE DIMENSIONAL COMPUTER WORD PUZZLE.

Five minutes after Jennifer sat down at the computer with Crypto Cube, she was hooked. First she worked her way through the many word puzzles that come with the game. Then her parents typed her spelling homework into new puzzles.

Then Jennifer started making puzzles for her parents!

So now, Crypto Cube is the favorite family game in Jennifer's home.

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DESIGNWARE MAKES LEARNING COME ALIVE.

If you own an Apple][plus, Apple //e IBM-PC, Atari 400, 800, or 1200XL with a disk drive, you should take a close look at all the DesignWare software.

Another word game, Spellicopter,™ is an action-packed spelling game. You'll fly perilous missions through crowded skies and mountainous terrain to rescue words. And you'll want to keep an eye out for our new math and science games. See your local dealer or call DesignWare at (800) 572-7767, in California (415) 546-1866 for our free software catalog. You'll be delighted with the way your kids will learn with DesignWare.

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CIRCLE 152 ON READER SERVICE CARD

Radio Shack Model 100 vs. NEC PC-8201

David H. Ahl

I recently took a trip to the Far East. To keep notes from the trip, write memos and letters, and keep a record of expenses, I decided to take along a notebook computer. I had intended to take my Epson HX-20, although I was not thrilled at the prospect of having to use my kluged-up text editor which requires numbered lines of 255 or fewer characters. Epson has promised a text editing package, *Correspondence,* but I have yet to see a live one.

Then, two days before I was to leave, Radio Shack announced the Model 100. After a quick phone call to the product manager in Fort Worth to verify its capabilities, I dashed over to the local Radio Shack Computer Center and bought an expanded 24K Model 100 for $999.

The machine is wonderful and nearly everything that I hoped, hence when I saw the NEC look-alike in Japan, the PC-8201, I decided to get one to do a comparison report.

In most respects, the two machines are virtually identical. Yet industry insiders who have been exposed to both have sharply different preferences. Following are some of the reasons, and my judgement as to which machine wins on each count.

Physical Size and Shape

The Model 100 slants slightly from 1.7" at the front of the case to 2.0" at the back. The NEC slants from 1.6" to 2.5". Thus, the NEC is slightly larger but provides a more convenient viewing angle for the LCD screen. A tossup.

Keyboard and Function Keys

The ENTER key is larger on the Model 100, a nice plus. Also, the NUM key on the Model 100 designates ten alpha keys as a numeric keypad; the NEC does not have this feature.

The Model 100 has a graphics control key that permits direct typing of 56 graphics characters and 17 other symbols (mostly mathematical). A CODE key gives the user access to three fractions and 58 foreign letters with various accents.

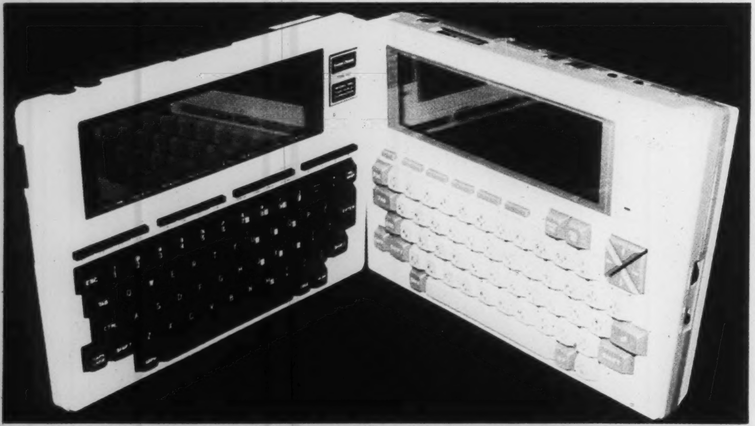
The NEC, on the other hand, offers 58 Katakana characters, not much to use here in the U.S., but only 16 built-in graphics characters. However, 61 characters are "blank" and may be user defined with a short program, CHRDEF, which comes with the computer on a demonstration tape. No clearcut victor here.

The 100 has eight function keys compared to five on the NEC, however, each of the five can select two functions by pressing the SHIFT key, making ten in total. The Model 100 has a PAUSE key; the NEC does not. Another tossup.

The cursor control keys are in a horizontal line on the 100 while they are in a much more natural sequence arrangement on the 8201. NEC wins this one.

Memory and Interfacing

The low end Model 100 ($799) has 8K of CMOS user memory while the low end NEC (no U.S. price yet) has 16K. A 24K Model 100 is also available ($999) as well as an 8K upgrade kit ($119 plus $15 installation). The NEC machine can be expanded to 32K internally in 8K increments. In addition, an external plug-in 32K memory module is available. Files can be dumped to this memory module as to a cassette or disk; thus its name, Ram Disk. I like the NEC approach here.

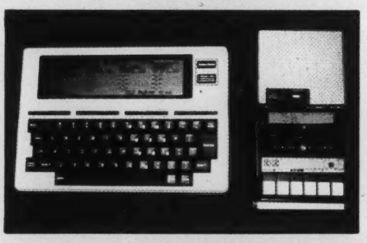


Face-off: Radio Shack Model 100 (left) versus NEC PC-8201.

MODEL 100
PORTABLE COMPUTER

The Radio Shack Model 100 includes a 224-page manual and quick reference guide.

The NEC PC-8201 includes a user guide, Basic reference manual, demonstration tape (8 programs), and cassette cable.



It seems a shame that the power output from a full-size cassette recorder is required by these computers.

THE HEAD OF THE CLASS

THE GAME SHOW
Computer Advanced Ideas
CAI
THE GAME SHOW

Give your child the thinking tools that stand in a class by themselves: programs for your home from Computer-Advanced Ideas.

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As professional educators and programmers we've been proving for over a decade that motivated learners do best. Featuring full-color graphics, our animated learning games are fun. They talk like a friend, play like a teammate and teach like a tutor. And they stimulate eager young minds.

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CAI programs come with a library of knowledge for your child to explore. But that's just the beginning. They also feature a unique authoring system that lets you create lessons on any subject, tailoring the program to your child's needs. No knowledge of computers is required. Our programs make sense to *people* — from 4 to 94 — and grow right along with your child.

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Your child's future begins with opportunities you create at home. Choosing resources that are stimulating, challenging and fun can be one of the best decisions you make. Ask your computer retailer for a demonstration of CAI programs and see for yourself how enjoyable a good education can be.

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For the Apple II/IIe

CIRCLE 121 ON READER SERVICE CARD

Compute While You
the Buffer that

Your computer is a real whiz when it comes to time. Like you, it works fast. But most printers don't. Most printers are *slow*. If you ever have to wait for your printer you are wasting time. Valuable time.

But with Microfazer, there's no more waiting. Microfazer is the print buffer that frees your computer. That lets it work fast. That helps you work faster, too.

512K

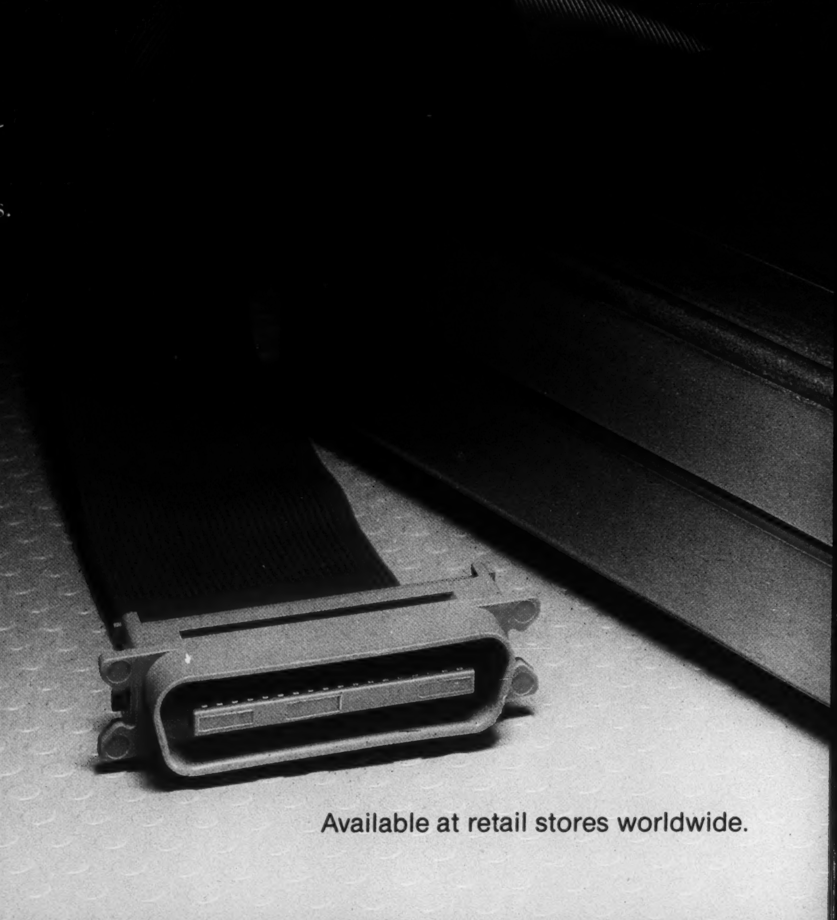
THE "ANY COMPUTER ANY PRINTER" BUFFER

Microfazer goes with anything. Printers. Plotters. Even modems. Perfect for any data processing environment, it's truly the "any computer any printer" buffer. With models for any data transmission need. Serial or parallel. Or to interface incompatible devices. And there's always the traditional Quadram Quality. The assurance you are getting the finest buffer available.

QUADRAM QUALITY

MICROFAZER REMEMBERS IT ALL

Microfazer stores data from your computer in its own memory, then sends it to the printer at a rate the printer can handle. And Microfazer can be expanded at any time to meet all your future requirements. The print buffer that offers 512K of memory—a full half-megabyte—Microfazer can handle *any* buffer task. Word Processing. Accounting. Graphics.



Available at retail stores worldwide.

Print with Microfazer,™ Remembers It All.

You name it.

So stop worrying about losing vital data because you run out of buffer space. Whatever the job—no matter *what* the size—Microfazer remembers it all.

BUT MICROFAZER REMEMBERS MORE…

Microfazer remembers to give you the hardware features you're looking for in a print buffer. Features that include a Ready LED, manual Reset and Pause/Copy buttons. And Microfazer comes in a variety of convenient sizes. To stand alone or stack with other peripherals. To snap onto the back of the popular Epson printer. There's even a model that plugs *inside* an Epson!

CHRONOGRAPH
MODEM
MICROFAZER
Reset Ready Error
Copy

AND PRICED RIGHT, TOO

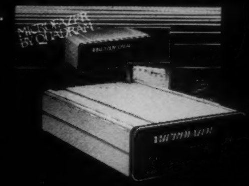
And with Microfazer you don't have to wait because of price. Parallel to parallel versions start at $159 (8K), serial to parallel and parallel to serial versions start at $199 (8K with cable), and serial to serial versions start at $229 (8K with power supply).

MICROFAZER
QUADRAM CORPORATION

Special version for attaching directly to the popular Epson printer.

Available in models from 8K to 512K.

So stop waiting on your printer. Compute while you print with Microfazer. You'll never have to wait again.


MICROFAZER BY QUADRAM

MICROFAZER.
THE PRINT BUFFER.
THAT REMEMBERS IT ALL.

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CIRCLE 178 ON READER SERVICE CARD

move the file back to the execution mode. Although in this manner all the functions of Text can be brought to bear on a Basic file, it is a curious arrangement. Still, it is better than my initial fear when first working with Basic—that screen editing was impossible. It *is* possible, though a bit inconvenient.

Documentation

I don't need to say very much about the documentation that accompanies the package beyond the fact that it is superlative. It comes as a large spiral bound main reference and a small *Quick Reference Guide.* Both works are excellent. The main documentation is easy to read, simple to understand, and superbly indexed. The only thing missing is a memory map. The reference guide is very handy.

I'm sure you can see that the pluses of the TRS-80 Model 100 outweigh the minuses by at least 5 to 1. And so I can candidly share the balance of the constructive criticisms I have of the unit, without changing your justifiably high opinion of it. Here we go:

Criticism

- Cassette storage is a highly unreliable medium. I hate using conventional cassettes for anything other than audio applications. They are slow, flaky, and do not offer random access. To offer such a professional machine and then relegate users to cassette storage is like making them wear sneakers with a tux: it's just out of place. Okay, the possibility of a disk drive connected to the expansion bus sounds feasible. But drives are expensive, heavy, and require AC. How about a portable *wafertape* unit (stringy floppy), to plug into the cassette port? This might be a very practical solution. In any case, cassettes don't make it, even at a respectable baud rate.
- How about some more memory? The NEC computer can handle 64K inboard, and is hardly bigger than the Model 100. Why was the capability cut in half?
- What happened to the user cartridge slot? The NEC computer has an expansion bus on the side and a provocative CMOS RAM cartridge among other

Both machines have a hefty operating system overhead which cuts into available user memory, 3130 bytes on the Model 100 and 4010 bytes on the NEC. In addition, the lowest 192 bytes cannot be used. For my purposes, this means that the low end 100 is totally impractical since it has only 4870 usable bytes (less than three double spaced pages of text).

Several problems result when memory capacity is approached. With 192 bytes left, (remember, they are unusable), the NEC refuses to do anything (print, save, transmit), yet with 193 bytes left, all is okay.

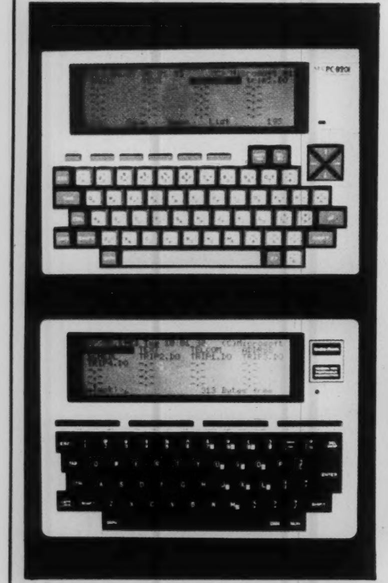
Memory capacity limitations rear their ugly heads much sooner on the Model 100, particularly when editing Basic programs. For editing, the program must be swapped in and out of the Text area, hence your remaining memory must be twice the size of your program. Of course, you can modify programs without any swapping by retyping entire lines. Why Tandy didn't follow the lead of NEC and allow cursor-controlled on-screen editing of Basic programs is beyond me. But who knows, maybe that's what the extra 880 bytes of overhead on the NEC are for. No clear-cut winner here.

The left side of the NEC machine contains a 48-pin bus connector into which memory or other expansion cartridges can be plugged. The 8201, unlike the Model 100, also offers a floppy disk drive interface. Both machines have an RS-232C interface, Centronics parallel printer interface, and bar code interface; the 8201 has an additional serial interface, which, according to NEC, is for an external memory device such as an external 128K RAM board. The NEC PC-8201 gets my vote here.

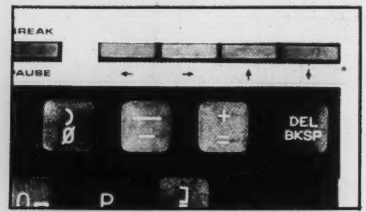
Both machines have built-in communications capabilities although the NEC does not have a built-in modem or the auto dial capability of the Model 100. Kudos to Radio Shack.

Software

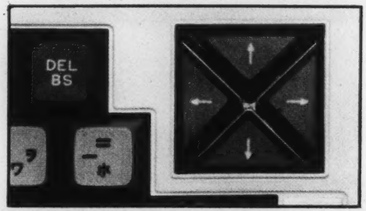
The Radio Shack Model 100 has five software packages built in: commu-



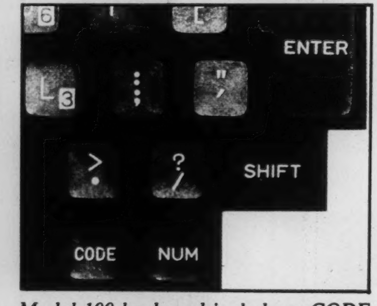
Outwardly, both machines appear virtually identical.



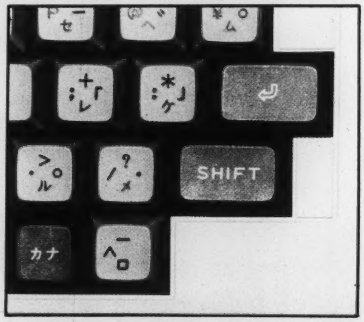
The four cursor keys on the Model 100 are in a horizontal line.



Cursor movement keys are laid out in a logical pattern on the NEC 8201.

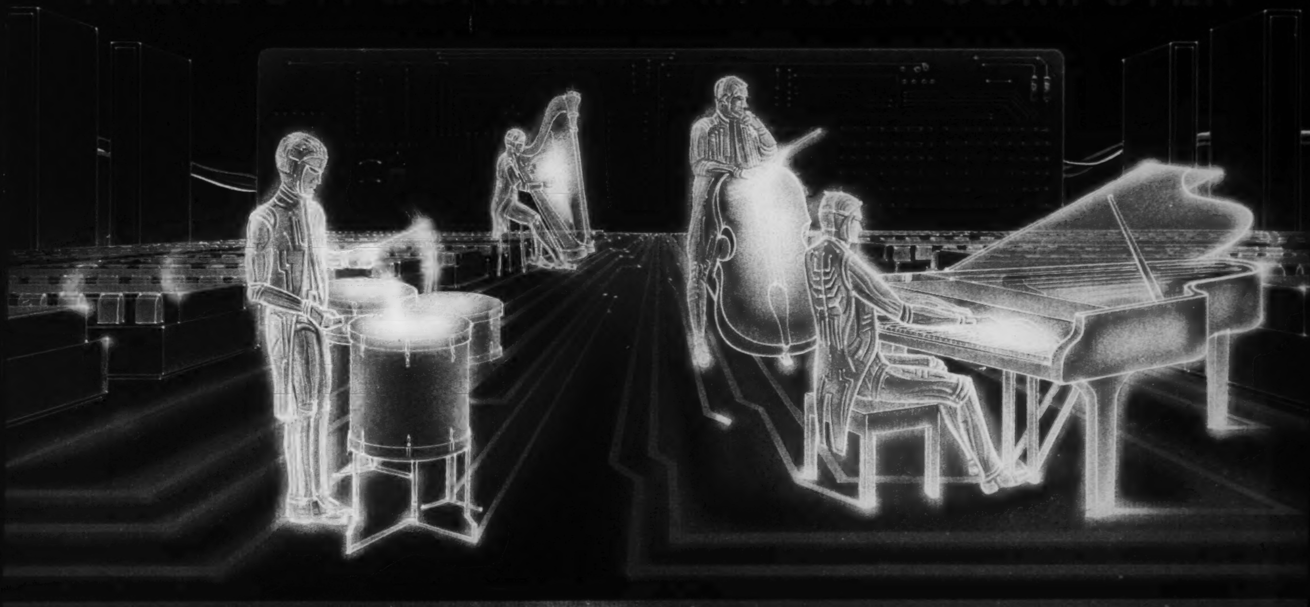


Model 100 keyboard includes a CODE key for foreign letters, NUM key for numeric keypad, and large ENTER key.

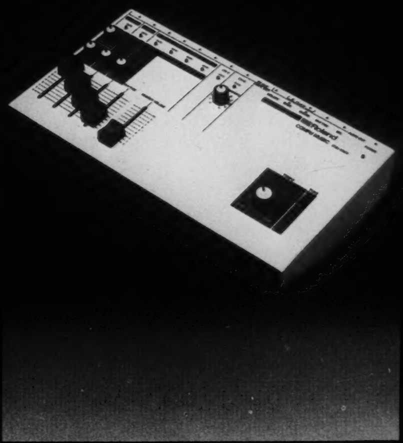


NEC 8201 has Katakana key, no numeric keypad, and smaller ENTER key.

THERE'S A CONCERTO IN YOUR COMPUTER



COMPU-MUSIC



...And a waltz, a blues song, a rhapsody, and a whole lotta rock n roll. In fact, your computer can now play any kind of music, thanks to the new Roland Compu-Music.

Roland, the world's leading producer of synthesizers and electronic musical instruments, has put its years of music programming experience into a high performance computer/music synthesizer system that can easily be used by anyone—from the computer-user with a musical background to the programmer with a song in his heart.

The Roland Compu-Music does for music what the word processor has done for words. The Compu-Music software allows your computer to write, program, change and store musical compositions of up to eight voices, plus a seven voice electronic drummer. The Compu-Music hardware (CMU-800) is a music synthesizer that plays these musical parts.

The CMU-800 connects to your computer through any auxiliary slot and then connecting to any amplifier or stereo system for performance. Because the Compu-Music system is software based, it allows for virtually infinite hardware expansion. It can never become obsolete.

Playing and programming the Compu-Music is so easy that you don't have to be a musician, but if you are, you'll appreciate the well-thought-out programming, a system that Roland has used for many years with proven success. Also, the CMU-800 hardware easily interfaces with many other synthesizers for expanded performance—all controlled by your computer.

The Roland CMU-800 Synthesizer retails for $495.00. The Compu-Music Software retails for $70.00 and is available for the Apple II and NEC computers. For more information, see your computer dealer or contact:
RolandCorp US, 2401 Saybrook
Avenue, Los Angeles,
CA 90040 (213) 685-5141.

CIRCLE 255 ON READER SERVICE CARD

Roland

We Design The Future

plans (see sidebar). Why was this phased out?

- Why is the auto-dial feature limited to pulse dialing, disallowing its use on some touch tone-only exchanges?
- Why the linear cursor control? The NEC uses a very nice triangulated square format to provide a directional cursor layout. Why was this canned?

And most important of all:

- Why is the Model 100 so expensive? Sure, CMOS technology is still young, and CMOS ROM and RAM are much more costly than conventional memory. Still, at over $1000 a pop for a maximally configured machine, only those with a nose for novelty will run out to buy. I have a strong hunch that because the 100 has no real market rivals right now, "profit-taking" (as they say on Wall Street) may be the order of the day. As soon as other machines as practical as the 100 appear, prices will begin to drop. And they will keep on dropping. At $299 for a Model 100, even *Creative Computing* Managing Editor Peter Fee will start thinking about buying one.

One further note. A couple of days before the Model 100 showed up at the lab, I read an understated but positively disquieting little pamphlet from Canada concerning the dangers of VDTs ("video display terminals," new vogue acronym for CRTs, monitors, video tubes).

While it took pains to label all results inconclusive, it pointed a wary finger at the tubes, and said that while they may not cause cataracts, they may cause eyestrain, migraine, and back pain. I also got the vague impression that pregnant ladies should stay the heck away from them.

Well in my job, I spend all day in front of a CRT, then go home and spend half the night in front of another one. Of course, I take some time off. Then I usually watch TV. Then I wonder why my eyes are glazed.

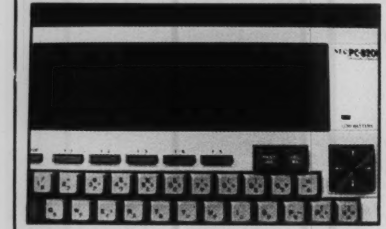
Well the Model 100 has helped me to relax a bit about those fears, by allowing me to do serious data processing away from the gamma glow. I am sure that in the future I will spend much less time basking in phosphor x-rays. And until they show that LCDs are bad for you too, I'll stick with the TRS-80 Model 100. □

nications, text editing, Basic, appointments scheduling, and address handling. The NEC offers only the first three of these. The Model 100 is a clear victor.

Documentation and Extras

The 224-page spiral bound manual with the Model 100 is excellent—by far Radio Shack's best manual to date (except for the Color Computer manuals which are also excellent). In Japan, the 8201 comes with two 6" × 8½" manuals, each with 200 pages. One is a user's manual, the other a Basic reference manual. (I assume these will be translated for the U.S. market). The Model 100 also comes with a 50-page pocket reference guide, something not included with the NEC. Since I can't read Japanese, I'll give the nod to the Model 100 for documentation.

Model 100 main menu includes five built-in programs and notes day of week.



NEC 8201 has three built-in programs. Eight functions (Load, Save, Name, etc.) can be selected by function keys from the main menu.

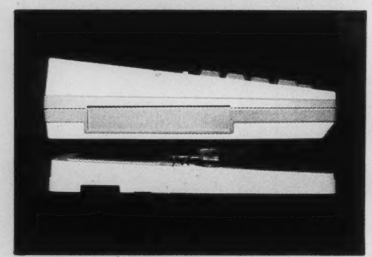
On the other hand, the 8201 includes a demonstration tape of eight programs including two games played on the LCD screen. These, incidentally, would not run on the 100 because of the missing LOCATE command.

The 8201 also includes a cassette cable, a $5.95 extra with the Model 100. A printer cable for each will set you back another $14.95, although I was charged $19.95 in a Los Angeles area Radio Shack (is there a higher price west of the Rockies?).

The modem cable costs $19.95 anyplace. For included extras, the NEC wins.

Incidentally, neither machine will operate with most pocket microcassette recorders. These small units just don't have the output power to drive the computer cassettte interface. The smallest one I found that works is a Panasonic RQ-8300, a unit specially designed for use with a computer.

Both computers use four AA batteries for regular operation while built-in NiCad batteries keep the memory and clock going. The NEC has a removable AA battery housing, an extra one of which is available, but it is not clear that this is any handier than carrying four spare AA cells.



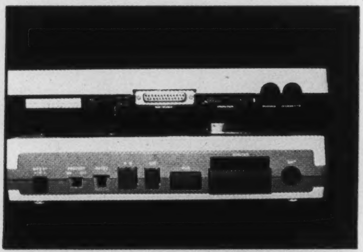
Side view shows higher profile of the NEC 8201 (top) compared to the Radio Shack Model 100. NEC has cartridge slot; Model 100 does not.

The Bottom Line

Pros of the Radio Shack Model 100 are its slightly smaller size, large ENTER key, numeric keypad option, extensive built-in graphics character set, pause key, 880 fewer bytes of overhead, built-in modem with auto dial capability, and five built-in programs compared to three on the 8201.

Pros of the NEC PC-8201 are its slightly better viewing angle, ten function keys, logical cursor movement keys, on-screen Basic program editing within Basic, definable graphics characters, LOCATE command for graphics, side expansion connector and external 32K memory cartridges, floppy disk interface, and included cassette cable and demonstration tape.

Which is the winner? You are, the customer. They are both great machines and if you have trouble deciding between them, why not do as I did and get one of each? That's the best of all possible worlds. □



I/O connectors on the NEC 8201 (bottom) are covered with plastic doors (the printer door is removed) while the connectors on the Model 100 are exposed.

TOF SET
SEL
FORM FEED
LINE FEED
OKIDATA
μ92
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TEXAS INSTRUMENTS COMPACT COMPUTER 40
COMPACT COMPUTER 40
SHIFT
ENTER
CLR

Texas Instruments CC-40

Joe Devlin

When I first saw the Texas Instruments Compact Computer 40 (CC-40) I assumed it was a diminutive example of the notebook computer. Notebook computers are a new breed of machine. They are small (notebook-sized) computers that feature a typewriter style keyboard, a nonvolatile memory that retains information in memory when the computer is turned off, and a built-in display screen.

Closer examination, however, reveals that although the CC-40 is quite a little powerhouse and has much in common with the notebook machines, it lacks some of the features needed to compete in the notebook class.

The CC-40 is a handsome silver computer the size of a large paperback novel. This small size (9.5" × 5.75" × 1") is one of the factors that places it in the pocket computer rather than the notebook class. The machine is slightly larger than most of the hand-held computers such as Radio Shack's PC-2 and PC-4 and the Hewlett-Packard HP-75C, but smaller than notebook machines such as the Radio Shack Model 100. As such, the CC-40 provides a link between the hand-held programmable calculator and the desktop personal computer. The CC-40 packs a lot more power than most of the pocket units, but this power is trapped within a tiny body that makes it hard for the CC-40 to express itself.

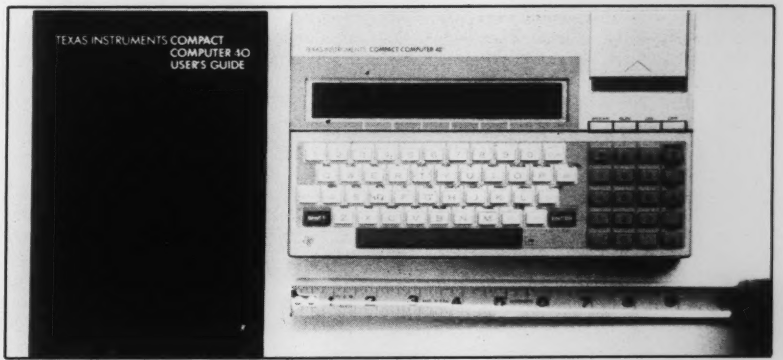
CMOS Processor

The heart of the CC-40 is an 8-bit CMOS processor. CMOS processors use very little power as compared with normal chip technology. This means that the CC-40 can be powered by batteries alone. More important, memory can be sustained, even after the machine has been turned off, with very little drain on the batteries.

The four AA alkaline batteries that power the system will last for up to 200 hours of powered-up use and will maintain your program in memory for months. Type in a program, turn the machine off, and the program will remain in memory and reappear when the machine is turned back on and the program is called back.

The TI CC-40
At a Glance

Computer: Texas Instruments CC-40
Microprocessor: 8-bit CMOS TMS 70C20
RAM Memory: 6K standard, 18K maximum
ROM Memory: 34K with Basic
Language, standard: TI Basic
Languages, optional: Editor/assembler
Keyboard: calculator style, numeric keypad
Display type: LCD
Character resolution: 1 line x 31 characters
Graphics resolution: 1 x 31 (5 x 8 dots)
Mass storage: cassette, disk, wafertape, plug-in cartridge (up to 128K)
Interface, standard: 8-pin Hex bus
Interface, optional: RS-232
Size, Weight: 9.5" x 5.75" x 1", 1 lb., 6 oz.


TEXAS INSTRUMENTS COMPACT
COMPUTER 40
USER'S GUIDE
TEXAS INSTRUMENTS COMPACT COMPUTER 40

The CC-40 is not much bigger than the instruction manual. Keys are calculator-style, but have positive action and both tactile and aural feedback.

BREAK
RUN
ON
OFF
8
9
0
CLR
NEXT
GOSUB
RETURN
I
O
P
=
PRINT
USING
J
K
L
;
CALL
M
ENTER

Directional keys control position of cursor and LCD display (1 line x 31 characters) within program. Black markings over keys are actually on a removable, transparent overlay. Reset button is flush with the case to prevent accidental activation.

In addition, there is an automatic power down feature that shuts the machine off when it is left unattended for more than ten minutes. If you prefer, the unit may also be connected to an optional $15 AC adapter and plugged into a wall outlet.

A Tour Of The Keyboard

The keyboard on the CC-40 features a well built miniaturized typewriter-style (QWERTY) key arrangement and a numeric keypad. A tilt stand is built into the back of the console to provide an optimum viewing and keying angle.

By using the left SHIFT key, the typist can type both upper- and lowercase letters. The uppercase lock is activated by pressing the SHIFT and UCL keys simultaneously. The uppercase lock causes all the alphabetic keys to be shifted to uppercase while leaving the operation of the numeric and punctuation keys unshifted.

There is no right shift key; there is an ENTER key where the right shift key would be.

The numeric pad on the right includes the numbers 0 to 9 arranged in calculator fashion and a few other keys. Above the numbers on the top row of the pad lie the four cursor control keys. The right and left cursors provide easy access to an 80-character line even though only 31 characters are displayed. The other two cursor keys provide an easy way to page through the lines of the program stored in memory.

Above the numeric pad is a row of keys that includes, the ON and OFF keys along with RUN and BREAK. The BREAK key will halt an executing program. Pressing the RUN key followed by ENTER causes the current program in memory to execute.

The Display

The CC-40 uses a single-line, 31-character liquid crystal display (LCD) screen capable of supporting both upper- and lowercase letters as well as numbers and a variety of special graphics characters.

The display can be scrolled back and forth revealing a 31-character window that opens upon the 80-character screen memory. A contrast control (actually display angle) is provided to adjust the screen for optimum viewing.

The LCD screen also displays several special status indicators above and below

TI Compact Computer 40 Basic

David H. Ahl

I recently wrote a book, *The Texas Instruments Home Computer Ideabook.* As a result, I became very familiar with TI 99/4A Basic, a bare bones implementation of the language with virtually no bells and whistles. Hence, it was with mixed emotions that I approached the CC-40.

My excitement started to build as I read the first few sections of the manual. Good grief, could CC-40 Basic really have come from the same folks in Texas who brought us 99/4 Basic?

The CC-40 has a truly excellent Basic. In addition to all the expected commands and functions, there are some that set this computer apart.

- 15-character variable names.
- 1-, 2-, or 3-dimensional arrays.
- Function calculations in either radians or degrees.
- Multiple statements on one line.
- Accuracy to 11 decimal places.
- Numeric range from 10^{-128} to 10^{126}.
- Logarithmic functions LOG and LN.
- Six trigonometric functions including arcsin and arccos.
- Subprograms using SUB and CALL.
- Functions to provide both floating point and integer random numbers.
- Five methods of entering input data: INPUT, LINPUT, ACCEPT, KEY$ (like INKEY$ in other versions of Basic), and CALL KEY (reads keyboard buffer without halting program).
- Two methods of displaying output data: PRINT and DISPLAY (more versatile than PRINT). IMAGE can be used to format either PRINT or DISPLAY (similar to PRINT USING).
- Ten user-defined function keys with up to 80 characters per function. A function can be an entire subprogram callable from either Basic or immediate mode.
- Immediate mode calculations do not require a PRINT statement to precede the calculation. In this sense, the CC-40 is exactly like a powerful scientific calculator.
- Automatic line numbering and renumbering commands.
- Quotation marks possible within a string, for example, the following is a legal string:

  She said, "I love you," and left.
- Simplified editing of Basic statements. The cursor keys are used to move within a statement. When a change has been made, RETURN is pressed without having to move the cursor to the end of the statement.

Of course, there are some idiosyncrasies as well. The first program I wrote (a very simple one) just would not display any output. I finally traced this to the fact that the output was displayed so quickly that it could not be seen before the computer went on to the next command (or stopped). When the CC-40 finishes a program, the last line of output is not left on the screen; presumably this is to conserve battery life. Hence, to see any output, you must instruct the program to pause briefly before going on. Fortunately, this is easily done with the PAUSE command which causes the CC-40 to pause for the number of seconds specified, i.e., PAUSE 2 pauses for two seconds.

Bottom line: CC-40 Basic is one of the best I have seen and is all the more remarkable for being on a computer this size.

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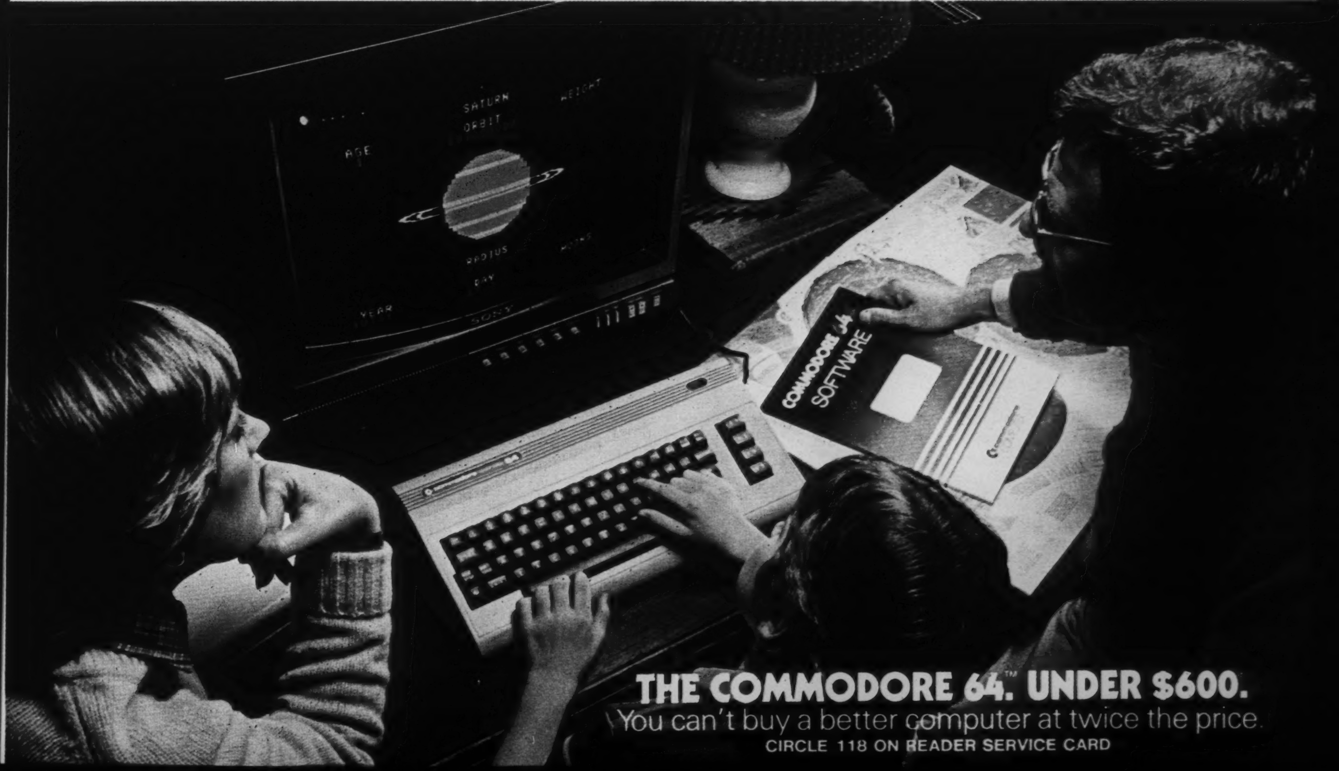

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the single line text display. These indicators warn when the uppercase lock has been set and when the function or control keys have been activated. Other indicators show if degree, radian or grad modes are active, whether I/O is in progress, if left or right scrolling or one of six user-settable flags has been set, if there has been an error, or if the battery is low.

Is There Such A Thing As Too Small?

There is a great deal of power in the little mite. The problem is that the human interface is not all it might be. This is primarily the result of the small size of the unit which necessitates the use of the single line LCD display and the calculator style keyboard.

I suppose it won't be long before it will be technically possible to produce a computer the size of an olive. Imagine trying to work a keyboard the size of an olive pit! Fortunately the keyboard on the CC-40 is calculator sized rather than olive pit sized.

Calculators, however, are worked with a single hand. The keys on the CC-40 are so closely spaced that single finger pecking rather than touch typing is the usual mode of data entry. On the other hand, the keys have positive action and provide both aural and tactile feedback. There was no hint of the keybounce that is a frequent plague on other computers with "Chiclet" style keys.

The single line LCD display aggravates the problem with working with the machine. It is difficult to enter and edit either text or a program when you can see only a portion of one line of text at a time.

Documentation

The User's Guide that comes with the CC-40 is slightly smaller than the computer. It is divided into five chapters, twelve appendices, and an index. It is a thick, well written tome that covers all the ground it should. One nice feature is an alphabetically arranged section with a page-long explanation of each Basic command, function, and built-in subroutine.

Basic

The Basic included in CC-40 ROM is a sophisticated one, with many features that appeal to those who are used to programming in higher level languages such as Fortran. Along with all the standard PEEKS, PRINTS, LISTS and control loops, the CC-40 provides several interesting bells and whistles.

For example, CC-40 Basic contains an ACCEPT command which accepts data at any position in the display, can sound an audible beep to alert the user that data are being solicited, checks the data for type (numeric, positive, negative, character) and length, and provides a default in case null data are input. What convenience! What class!

> ***The designers have thoughtfully provided function keys that will enter an entire command at the press of two keys.***

CC-40 also provides an IMAGE command that allows Fortran-like formatting of output data. PAUSE waits for any key to be pressed, or for a specified length of time (good for waiting for user acknowledgement that a message has been read). The ON ERROR command allows the programmer to preset the action to be taken when an error occurs during the execution of a program. The DEBUG command allows access to an assembly language debugger. INDIC lets you set display indicators on or off through software. In short, there is a lot to this Basic.

The most wonderful feature in CC-40 Basic is the provision for full parameter passing, by value and by reference in subroutine calls (called subprograms by TI) through the CALL statement. The programs in the box below perform almost the same functions. One is written in standard Basic, using GOSUB (which is

Subprogram SUMIT in Listing 2 and the subroutine in lines 200-230 of Listing 1 both add two numbers and store them in a variable called SUM. The only difference is that subroutine 200-230 zeroes variable B and SUMIT does not touch it.

Unlike a standard Basic GOSUB, the CALL statement includes a list of the variables that the subprogram will use from the calling program. Any other variables mentioned in the subprogram are unique to it, and the storage for them is not retained when the program exits the subprogram (as, for example, variable A). Notice also that two of the variables being passed to subprogram SUMIT are in parentheses. This means that only their values are passed. SUMIT cannot change the values of J and B; it knows only what their values were when SUMIT was called. (This is just as well, because if J were set to zero, our FOR . . NEXT loop would be messed up.) SUM, however, is passed by reference, which means that SUMIT is free to change it, which it does, by returning the SUM of J+B in it. The J, passed by the CALL, is renamed A inside the subprogram. Any integer can be passed to SUMIT, and we do not always have to store it in a variable with the name J before calling SUMIT.

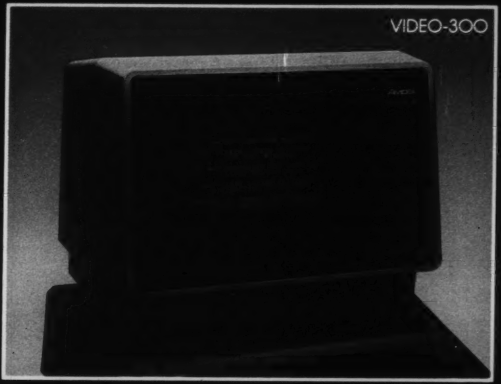
Listing 1.

```
10 REM GOSUB VERSION
20 FOR J=1 TO 100 STEP 1
30 A=J*5
40 B=A+10
50 GOSUB 200
60 PRINT A,B,SUM
70 PAUSE
80 NEXT J
90 STOP

200 SUM=A+B
210 A=0
220 B=0
230 RETURN
240 END
```

Listing 2.

```
10 REM CALL VERSION
20 FOR J=5 TO 500 STEP 5
40 B=J+10
50 CALL SUMIT ((J),(B), SUM)
60 PRINT J,B,SUM
70 PAUSE
80 NEXT J
90 STOP

200 SUB SUMIT(A,B,SUM)
210 SUB=A+B
220 A=0
230 B=0
240 SUBEND
250 END
```

industry breakthrough



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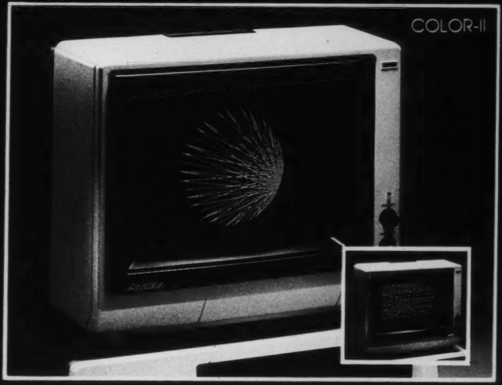

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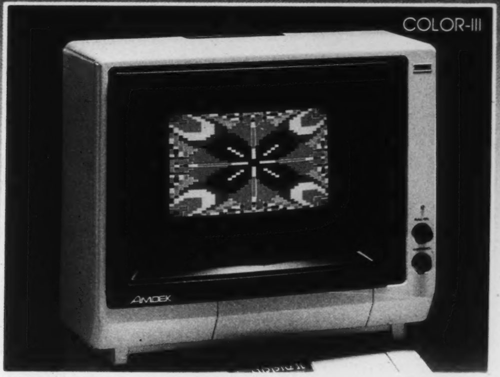

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available on the CC-40 for those who want such things). The other uses parameter passing by reference and by value to create a much neater version.

Structured programmers will be delighted with this CALL instruction. And even those who are not always as structured as others might like them to be will find it exhilarating to be able to name a function, instead of just giving it a number. CALL statements can also be used to access some built-in subprograms such as CLEANUP, which deletes unused variable names from the system and SETLANG, which can change the language in which the prompting messages are displayed.

This Basic is nifty. Not only that, but despite the small size of the keyboard, it is easy to enter. This is because the designers have thoughtfully provided function keys that will center an entire command at the press of two keys. The plastic keyboard overlay provided with the machine is the path to easy access of Basic keywords. Hold down the FN (function) key on the numeric pad, press the appropriate key as indicated by the keyboard overlay and *voila!* Basic in an instant. Control functions are similarly accessed by pressing the CTL key followed by some other key.

The programmer who wants more than the built-in Basic commands can program his own user-assigned strings. These can be strings of characters, commonly used math expressions, or even memos of up to 80 characters. User-assigned expressions can be recalled by hitting the FN key along with the numeric key (1 to 9) assigned to the phrase.

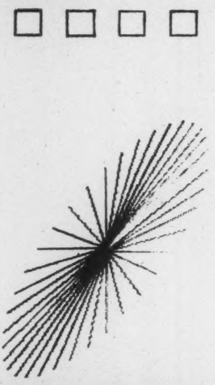
All Basic calls, whether typed in or entered with the help of a function key, are edited with the line editor. Left and right arrows allow for non-destructive movement through the text line. Up and down arrows move you from line to line, as does the LIST key. Individual characters in a line can be deleted or inserted. A character is changed by being typed over.

One quirk of this editor is that to delete an entire line you must DELETE it—just typing its line number does not suffice. I won't get into a debate as to whether this is a safety feature or just a pain.

I/O

There are two openings on the back of the unit. The most important is the 8-pin hex-bus peripheral port. Three peripherals that plug into the hex-bus port are currently offered—an RS-232 interface, a printer/plotter, and a wafertape drive. Next to the peripheral port is a socket for attaching the AC adapter. The cartridge port, which can accept either ROM cartridge software or memory expansion cartridges, is located in the upper righthand corner of the CC-40. On the bottom is a panel that covers the battery compartment.

This figure, plotted by the program below, was printed by the TI Printer/Plotter shown in the photograph.



```
20 INPUT "Enter ma
jor axis radius(0-
100)";A
25 IF A>100 THEN 2
0
30 INPUT "Enter mi
nor axis radius(0-
100)";B
35 IF B>100 THEN 3
0
40 INPUT "Phase re
lationship(-90-90)
";ROTATION
45 IF ROTATION>90
OR ROTATION<-90 TH
EN 40
50 PRINT "Pen colo
r":PAUSE 1
60 INPUT "1-black
2-blue 3-green 4-r
ed ";COLOR
65 IF COLOR<1 OR C
OLOR>4 OR COLOR<>I
NT(COLOR)THEN 60
100 DEG
110 OPEN #1,"10",O
UTPUT
120 PRINT #1,CHR$(
19)
130 PRINT #1,"M(11
0,-120)"
140 PRINT #1,"O"
145 PRINT #1,"C";S
TR$(COLOR)
150 FOR TA=0 TO 35
9 STEP 10
160 X$=STR$(INT(B*
COS(TA)))
170 Y$=STR$(INT(A*
SIN(TA-ROTATION)))
180 PRINT #1,"L(0,
0),(";X$;",";Y$;")
"
190 NEXT TA
```

Peripherals

Even though the CC-40 has a permanent memory, the size of that memory is limited to 18K, and sooner or later most users will want to save information on an external storage device. For this purpose Texas Instruments offers a $140 Wafertape drive (also called a stringy floppy). It uses removable, continous-loop cartridges that can store up to 48K. Continuous-loop cartridges offer a compromise between faster but more expensive disk storage and slower but less expensive cassettes.

Those who wish to attach a modem or 80-column printer to the computer can purchase an RS-232 interface for $99.95.

The x-y printer/plotter uses four tiny ballpoint pens to sketch color graphs or to print up to 11 characters per second. The plotter uses 2¼" wide plain paper and costs $199.95. The three peripherals are desktop units, not designed to be portable. Each is packaged in a silver box designed to be stacked one on top of the other, taking up the minimum amount of space on a desk.

Software

It is likely that most of the initial software packages for the CC-40 will be produced by TI. There are several factors that may prove to be barriers to the rapid proliferation of software for the

CC-40. The CMOS processor that is the heart of the CC-40 is relatively new and has never before been used as the CPU of a microcomputer. The Basic built into the machine is very powerful but not necessarily compatible with software offered for the popular Texas Instruments 99/4A computer. Neither the cartridge nor the Wafertape cassette is compatible with previous offerings by Texas Instruments.

Software for the CC-40 will be made available on either plug-in ROM cartridges or Wafertape. ROM cartridges retail for from $40 to $125. Initial offerings include *Mathematics, Finance, Perspective Drawing,* and *Business Graphics.* Wafertape cartridges sell for $19.95 and include *Elementary Dynamics, Production and Planning, Inventory Control, Photography, Electrical Engineering,* and *Profitability Analysis.*

For the CC-40 to become a success, it will have to find a niche for itself. There is no way that a calculator sized computer with a single-line LCD and a Wafertape drive will be able to perform many of the tasks performed by a personal computer with a full sized display screen, keyboard, and disk drive.

Nor will this machine be competitive in the world of notebook computers. Most notebook computers see a great deal of use as portable word processors, and the single-line display, tiny keyboard and minimal editor of the CC-40 limit its use as a word processor.

The most likely market for the CC-40 is probably in competition with hand-held computers like the Hewlett-Packard 75C or the Radio Shack PC-2 and PC-4. The CC-40 is well equipped to compete in this market.

The permanent memory and powerful Basic exceed the capabilities found in most hand-held computers. The large size of the machine results in a larger typewriter style keyboard, which, though not meant for touch typing, is better than that found on any hand-held.

The CC-40 is an attractive machine, even with its drawbacks. Just look at the possibilities it offers. If you are looking to learn Basic, it offers a very powerful and portable learning tool. If you are a salesman or engineer, it will calculate the solutions to formulas you use every day. If you are a student, about to take a Physics test—oh what a crib sheet you could create! Not only will the CC-40 keep track of all those equations you never memorized, but it will hold the comments you need to remind you which formulas are needed in which situations. And once the proper formula has been found, just key the variables into the equations and the machine will provide you with all the answers. ☐

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Dorian, Just found these behind the lobster crates. Hope they're not important. Stu
Ichiban Fish Supply May 31, 1983

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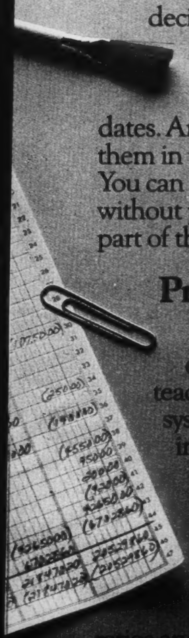

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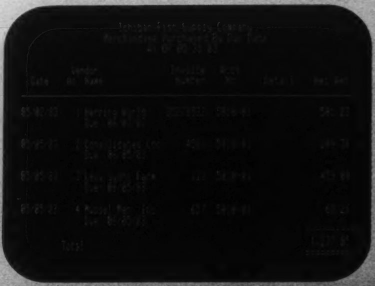

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CIRCLE 105 ON READER SERVICE CARD

creative computing equipment evaluation

Mattel Aquarius Home Computer System

Owen Linzmayer and David Ahl

Until recently, the name Mattel was associated mainly with children's toys, most notably, the Barbie doll and Hot Wheels. That was before the company decided to take a chance by trying to establish a foothold in the blossoming business of selling home video game systems. If we look at the unquestionable success of the Intellivision, it is apparent that the executives at Mattel made a wise decision.

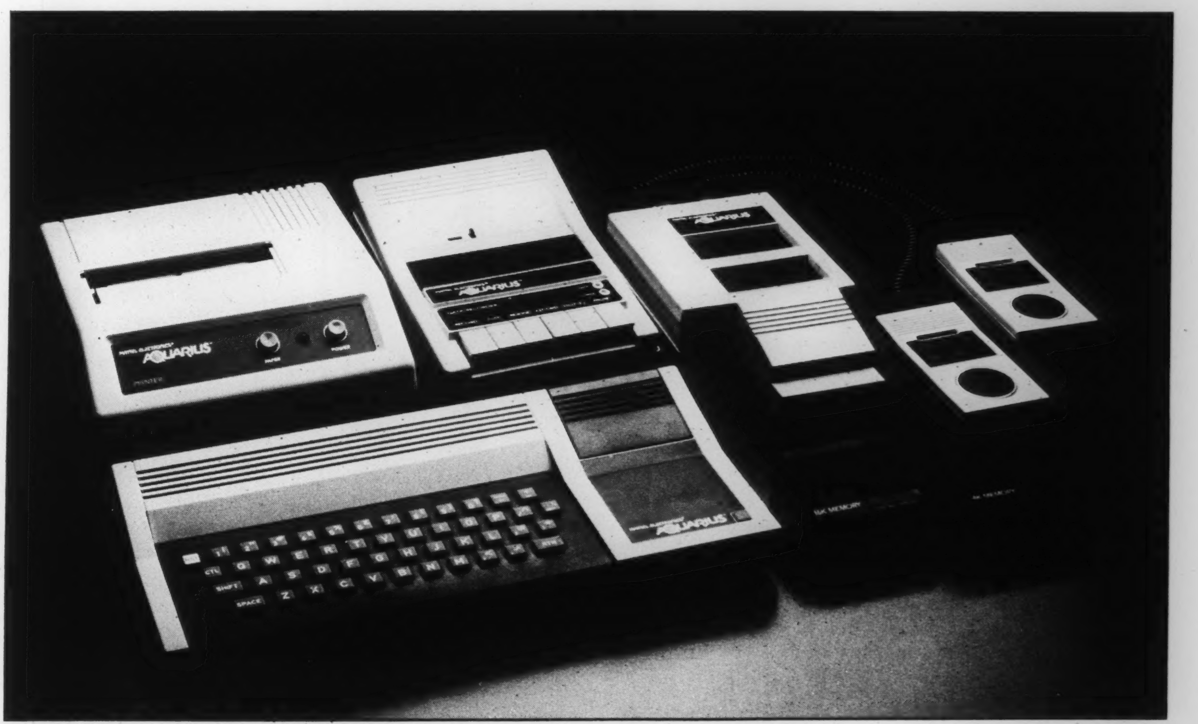
Can Mattel break away from its toy-oriented background? That is the question as Mattel now enters the already crowded home computer market with the Aquarius.

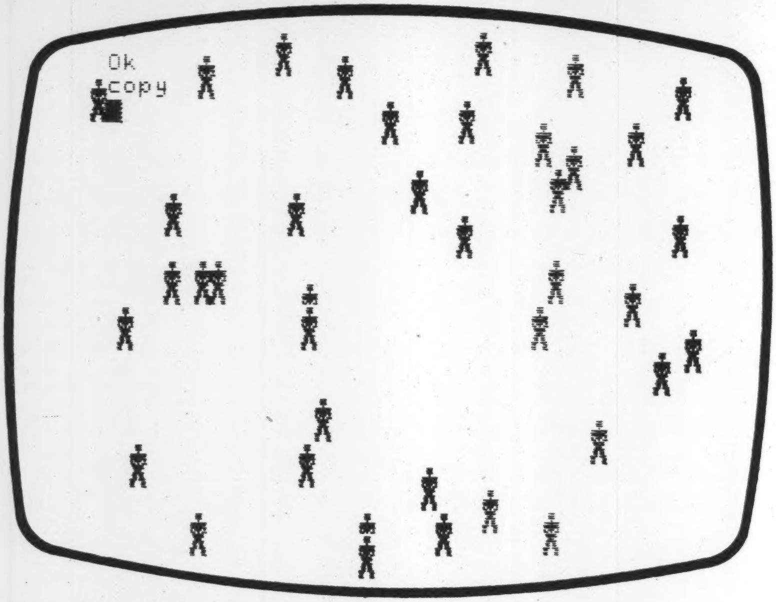
The Aquarius computer console retails for $100-$160, depending upon where you buy it. What exactly do you get for your money? The low-end, no frills Aquarius system features a rubber "Chiclet" keyboard, 4K RAM, a Z80A microprocessor, and a version of Microsoft Basic residing in ROM. You also receive a 10' video cable, TV switch box, power adapter, and two instruction manuals.

Let's take a closer look at the Aquarius and the peripherals available at the time of this writing.

The Aquarius Computer System at a Glance

Suggested List Price: $159.95
Dimensions: 13.5" x 6" x 2"
RAM: 4K, expandable to 52K
ROM: 8K
CPU: Z80A
Language: Microsoft Basic
Keyboard: 49 keys with shift and control keys
Video Output: 40 x 24 character display
80 x 72 pixel resolution
16 colors





```
Ok
copy
```

Screen output for Program 1 as printed on the Aquarius printer.

Console

The base of the computer measures 13.5" × 6" and is molded in a combination of black and off-white plastic. The back of the console is 2" high but slopes down to a sleek 1" at the front. The on/off switch is mounted on the righthand side of the computer, and a green LED located on the face indicates when power is flowing.

The Aquarius has a single edge-connector in the rear that allows the user to plug in either program cartridges or accessories such as the Mini Expander module. When the slot is not in use, a dust cover keeps the contacts clean.

The video-out connector is also found on the back, along with the TV channel selector (3 or 4). Situated next to this switch are the cassette and printer I/O ports. The power adapter cable enters the computer at the rear where it is permanently attached.

Keyboard

The Aquarius keyboard is a compromise between full-stroke and membrane—what we refer to as "Chiclet" style. Unlike a flat membrane keyboard, each key on the Aquarius protrudes above the surface of the computer. To the delight of smaller children, and to the disappointment of touch typsts, the 49 light blue rubber keys are spaced rather close together. There is a slot on each side of the keyboard so that overlays may be inserted easily.

> ***The current version of Microsoft Basic on the Aquarius leaves much to be desired.***

Most of the keys have both lowercase (normal) and uppercase (shift) characters. In addition, the control key provides 34 special keyword abbreviations. This is quite handy because the Aquarius is somewhat prone to key bounce (one press of a key is interpreted by the computer as two or three keystrokes).

Touch typists will find it particularly dificult to adjust to the Aquarius keyboard, mainly because of the positioning of the spacebar. Instead of its customary location, centered on the bottom row, the spacebar is found in the lower left-hand corner of the keyboard. What's more, it isn't even a spacebar. It is a small key. Granted, the space"bar" is larger than most of the other keys, but no bigger than the shift and return keys.

A better bit of keyboard design is seen in the reset key, which is surrounded by raised edges that prevent accidental pressing. If you hit the reset key by mistake, you can sometimes save your program by pressing CTL-C. The manual claims that CTL-C will always enable you to recover a program after pressing reset. Not so; it rarely works when programs use POKE statements.

Basic Language

The Aquarius comes with a version of Microsoft Basic residing in the 8K ROM. This version has somewhat fewer commands than some other implementations (see Table 1). Mattel plans to offer an Extended Basic upgrade later this year. This is similar to what Radio Shack did with their Color Computer.

The current version of Microsoft Basic on the Aquarius leaves much to be desired by the serious programmer. Probably the biggest inconvenience is that the editing features are extremely limited. If you find a mistake in your program, you must retype the entire line that contains the error.

```
290 PRINTCHR$(11)
300 H=12328
310 A=H+900*RND(1)
320 POKE A,19
330 POKE A+40,20
340 Z=Z+1
350 IF Z<40 THEN 310
360 END
```

Program 1. This short produces 40 little men, each consisting of two graphics characters (characters 19 and 20) that are POKEd *into graphics screen locations in lines 320 and 330.*

Screen Output

The Aquarius features an upper- and lowercase text display of 40 × 24 black characters on a blue field. With a one line command, the background and foreground colors can be selected from a pal-

Table 1.

ABS	DIM	LEFT$	ON	RETURN	STOP
AND	END	LEN	OR	RESTORE	STR$
ASC	EXP	LET	PEEK	RIGHT$	TAB
CHR$	FOR	LIST	POINT	RND	TAN
CLEAR	FRE	LLIST	POKE	RUN	THEN
CLOAD	GOSUB	LOG	POS	SGN	TO
CONT	GOTO	LPRINT	PRESET	SIN	USR
COPY	IF	MID$	PRINT	SOUND	VAL
COS	INKEY$	NEW	PSET	SPC	
CSAVE	INPUT	NEXT	READ	SQR	
DATA	INT	NOT	REM	STEP	

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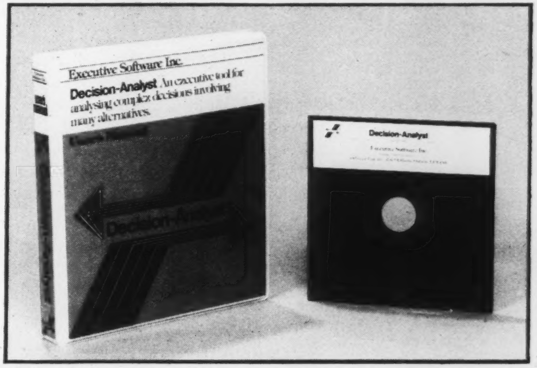
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CIRCLE 143 ON READER SERVICE CARD

ette of 16 colors. Unfortunately, there is no Color command; to color a block, the command is POKE (L,C). L refers to the screen location (13352 to 14311) and C to the color (0 to 15).

Low-resolution graphics characters may also be manipulated within the 40 × 24 screen grid using POKE commands. Fortunately, the character set contains a substantial number of graphics characters (160) in addition to the standard 96 ASCII characters (letters, numbers, symbols). Thus it is possible to achieve reasonable animation on the low-resolution screen.

With the present Basic, the highest graphics resolution available to the user is 80 × 72 pixels. This is achieved by dividing each block on the 40 × 24 grid into six pixels. Unlike the background, you cannot designate the color of a pixel; each pixel within a block of six is the same, although blocks may be individually colored. In this mode, the available commands are PSET(X,Y) to turn on a pixel, PRESET(X,Y) to turn it off, and POINT(X,Y) to determine if it is on or off.

```
10 PRINT CHR$(11)
20 C=INT(16*RND(1))
30 I=INT(11*RND(1))
40 P1=13352+40*I+I
50 P2=P1+40-2*I
60 P3=14272-40*I+I
70 P4=P3+40-2*I
80 FOR P=P1 TO P2
90 POKE P,C
100 NEXT P
110 FOR P=P2 TO P4 STEP 40
120 POKE P,C
130 NEXT P
140 FORP=P4 TO P3 STEP -1
150 POKE P,C
160 NEXT P
170 FOR P=P3 TO P1 STEP -40
180 POKE P,C
190 NEXT P
200 N=N+1
210 IF N<20 THEN 20
220 END
```

Program 2. This program produces 20 colored concentric rectangles using low-resolution graphics characters. Points P1 through P4 define the four corners of each rectangle.

```
10 PRINTCHR$(11)
30 I=INT(35*RND(1))
50 X2=79-I
60 Y2=71-I
70 FOR X=I TO X2
80 PSET(X,I)
90 PSET(X,Y2)
100 IF X2-X<=8 THEN 130
110 PSET(I,X)
120 PSET(X2,X)
130 NEXT X
131 C=C+1
140 IF C<20 THEN 30
150 END
```

Program 3. This program also produces 20 concentric rectangles using high-resolution pixels. Note the ease of using PSET *command compared to the* POKES *in Program 2.*

Unfortunately, the Aquarius does not have a clear screen (CLS) command. Instead, you must type PRINT CHR$(11). This is cumbersome, particularly since graphics characters do not automatically scroll off the screen when a listing is done.

The Aquarius system comes complete with two excellent instruction manuals.

Manuals

The Aquarius system comes complete with two excellent instruction manuals. The first booklet, entitled "Guide to Home Computing," gives detailed, illustrated directions on how to set up the computer. There are 11 chapters dedicated to introducing the beginner, as well as the more advanced programmer, to the Basic language and the particular features of the Aquarius. This manual is well written and explains each function in simple terms. To aid the learning process, hints, programming tips and examples are abundant. The omission of an index is the only disappointment in an otherwise excellent manual.

The second booklet is really a set of 16 "Simplified Instruction Cards." These pop up and are intended to sit next to your computer for quick and easy reference. If neither manual solves a specific problem, toll-free phone numbers are provided for service information and programming assistance. This is a luxury and is tremendously useful. Unlike the "help" lines of many other computer companies, these two are manned by a staff of knowledgeable and courteous people.

Printer

One of the most useful peripherals for a computer system is a printer. Whether it be for word processing or getting a hard copy of a program listing, a printer is an invaluable tool. The Aquarius printer is just like its computer counterpart: small and simple.

Two blue buttons and a green LED are all that is found on the front panel of the printer. The rightmost button is the power switch, and when the electricity is on, the LED lights up. Depressing the button on the left causes the paper to advance little by little.

The printer requires its own power source. It uses a unique serial interface; a connecting cord is provided. The printer manual claims that the Aquarius thermal printer has an alphanumeric print rate of 80 characters per second (cps) and a graphics print rate of "20 elementary lines per second." I did some of my own testing and found these numbers to be relatively accurate. The thermal printhead consists of a 5 × 7 dot matrix which prints blue characters on white 4 3/8" wide paper. The printer can output 40 characters per line, making it fine for listing a program, but a bit unorthodox for serious word processing. The printable characters include upper- and lowercase, as well as special character graphics. On the back of the printer is a three-position sliding switch that designates which mode the printer is in: graphics, mixed, or text.

The Aquarius Printer at a Glance

Price: $165

Dimensions: 7.5" x 8.5" x 3"

Speed: 80 cps alphanumeric, upper/lowercase
20 graphic lines per second

Printhead: 5 x 7 thermal dot matrix

Truckwidth: 40 characters per line

Like most thermal printers, the Aquarius model is fairly quiet.

Like most thermal printers, the Aquarius model is fairly quiet. In fact, most of the noise it produces seems to be caused by the friction feed paper advance system, not the process of printing. When the printer is waiting for input, it is absolutely silent.

The Aquarius printer comes with a small booklet that is in no way a technical manual. Also included with the printer are two rolls of thermal paper—one already installed. By the way, installing the paper in the printer is no easy task. After a bit of practice it does become easier, but it is still something I don't look forward to doing.

Mini Expander

The Aquarius computer comes with only one cartridge slot. The Mini Expander module has slots for both memory

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Aquarius, continued...

and program cartridges, two hand controllers, and two additional sound channels.

Designed in a fashion that is consistent with the computer console, the Mini Expander plugs into the cartridge slot and measures 4.5" × 5.5" when installed.

With the Expander, a memory upgrade cartridge can be inserted into the rear slot at the same time that a program cartridge sits in the front slot. I haven't seen it yet, but I assume that the 32K memory cartridge is used in conjunction with the 16K cartridge to provide the system maximum of 52K of RAM.

Mattel advertises each controller as having a 16-position disc, not joystick. This is true—and unfortunate. While those who are accustomed to the Intellivision may not mind the disc, I would much rather have a real joystick. Luckily you have two choices to improve the comfort of the controller: Buy either an Injoy-A-Stick adapter or a set of Thumb Saver cushion pads.

Each controller is detachable and accepts keypad overlays. The keypad consists of six rubber buttons. Why Mattel didn't make the Aquarius controllers compatible with the new Intellivision II controllers is beyond me.

The Aquarius Mini Expander at a Glance

Price: $60

Dimensions: 4.5" x 5.5" x 2"

Features: 2 program/memory cartridge slots,
2 additional sound channels
2 16-position hand controllers with 6 buttons

The response of the controller is very good once handling it is mastered. The cable connecting it to the Expander is a lengthy coil similar to those found on telephone handsets. Although the controllers work well with preprogrammed games, they cannot be accessed by the user from Basic. This is a major drawback for anyone who is interested in using the Aquarius to design game software. A representative at Mattel hinted that the Extended Basic may contain commands to allow the use of the controllers. One can only hope so.

Memory Expansion

As stated earlier, the minimum configuration Aquarius comes with 4K of user RAM. Additional 4K and 16K memory cartridges are now available. These augment the memory that is already permanently installed in the computer. A 32K upgrade is scheduled for release later this year. ☐

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The Epson MX-80 is the best-selling dot matrix impact printer in the world. It has been since its introduction. And despite the host of imitators it spawned, no one has been able to top it. Until now.

FX-80: Son of a legend.

The new Epson FX-80 is far more than just doo-dads added on to last year's model. It's the most astonishing collection of features ever assembled in a personal printer.

For starters, it's fast: 160 CPS. And clean. All the print quality Epson is famous for in a tack-sharp 9x9 matrix.

But that hardly scratches the surface.

Create your own alphabet.

With the new FX-80, you aren't limited to ASCII characters. You can create your own. Any character or symbol that can be defined in a 9x11 matrix can be added to the FX-80's already impressive library of type styles and stored in its integral 2K RAM.

So you can create "Sally's Gothic" or "Tom's Roman" just by downloading and modifying standard characters. Or you can create a custom set from scratch. Either way, you can store up to 256 new characters. And if you don't need a new alphabet, the RAM functions as a 2K data input buffer.

Who knows graphics better than Epson?

Nobody, that's who. And if you don't believe it, witness the FX-80.

With a 12K ROM capacity, the FX-80 gives you a few things the others don't. For example, not one, not two, but *seven* different dot addressable graphic modes are program selectable. And can be mixed in the same print line. Everything from 72 DPI (dots-per-inch) Plotter Graphics to the 640 dots per line resolution designed to match the remarkable monitor clarity of the Epson QX-10 personal computer.

And *that* is in addition to an astonishing array of 136 different user-selectable type styles including Proportional, Elite and Italic as well as the more conventional faces you get on other printers.

Hard-to-beat hardware.

The FX-80 has all the hardware features you've come to know and love on the MX Series: logic seeking, bidirectional printing, the by-now-famous disposable printhead, and more.

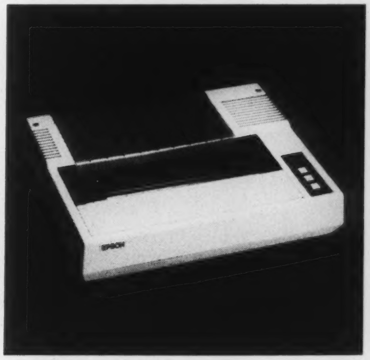
The FX-80 features an adjustable pin platen or optional friction/tractor feed, so you can use fanfold, roll or sheet paper . . . backwards or forwards. The FX-80 even gives you reverse paper feed.

And if you're printing forms, the FX-80 has a feature you're gonna love: a function that allows you to tear off the paper within one inch of the last print position.

Be the first on your block.

We'd be willing to bet that the FX-80 — like the MX-80 — will have its share of imitators. Don't be fooled. To make sure you get the genuine article, rush down to your local computer store right now and let them show you everything the FX-80 can do.

And while you're there . . . ask them to show you how it works with our computers.



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CIRCLE 141 ON READER SERVICE CARD

Petite Electronic Talking Typewriter

Stephen B. Gray

After several scattered articles on consumer products built around microprocessors, it's time to get organized, and settle down to an irregular series on the subject.

The three previous articles are: "Heathkit/Thomas Electronic Organ Kit" (June 1980, p. 54), "Electronic Music in Small Packages" (September 1981, p. 294; about the Casiotone M10 keyboard instrument), and "The Great Awakening" (December 1981, p. 105; about the General Electric 7-4880 programmable digital clock radio).

There will be more like this one, but not every month, nor at any regular interval. One problem is that although many consumer products containing microprocessors are on the market, many manufacturers of such products don't want to reveal what goes on inside their widgets, not even as little as a block diagram, without which an article like this would be reduced to a long new product item.

The point of this series is to show what microprocessors can do other than serve as the basis for computers, and to give some idea of how the products operate other than on the overly simple basis of "press this button and that happens." And although a talking typewriter represents a relatively simple use of a microprocessor, it is one of many products that couldn't be manufactured today without inexpensive silicon chips.

Petite Electronic Talking Typewriter

At first glance, the Petite Electronic Talking Typewriter looks very much like an ordinary children's typewriter with a blue plastic case and red plastic keys. But if you look closely, you'll see two special blue keys, FIG and LEVEL, and also a section to the right of the typewriter itself, with ON and OFF buttons, a battery compartment, and the words "Talking Typewriter" and "solid state."

Push the ON button, and after a short musical fanfare, a British-accented male voice says, "Hello, this is your Petite Talking Typewriter." Press any red key, and not only will the character be printed on paper, the voice will say the name of the letter, from A through Z. Press the FIG key, and you can print the numbers 0 through 9, and characters such as $ 1/4 1/2 &. But only the numbers will be spoken; the others produce a beep on the speaker.

That's only the beginning; the machine has a stored vocabulary for teaching children how to spell.

Spelling Game

Press the LEVEL key, and the voice says, "Level One selected," pauses, then

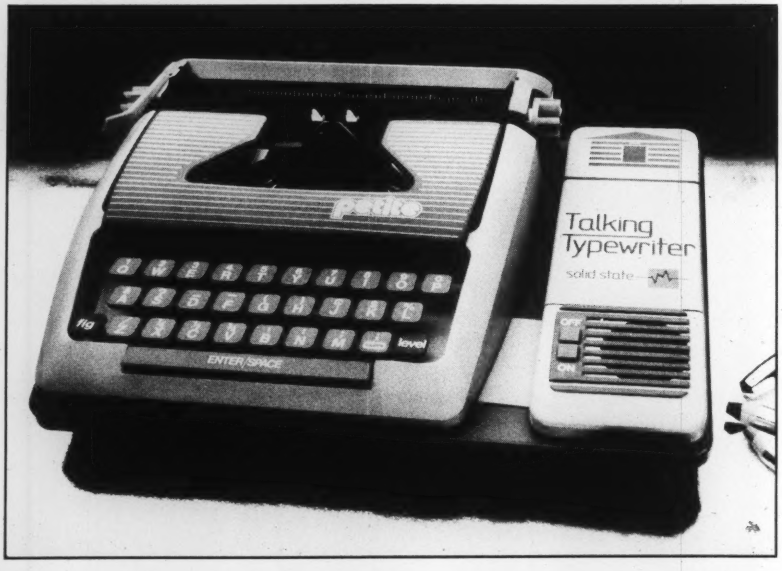

Figure 1. The Petite Electronic Talking Typewriter is advertised as the world's first talking typewriter for children.

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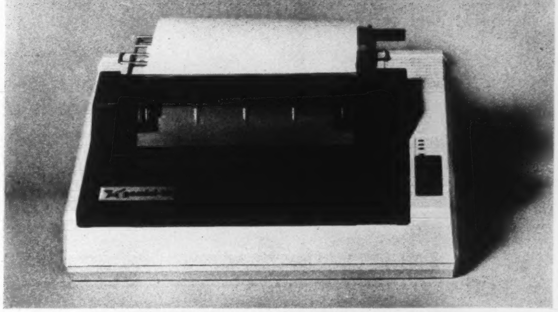

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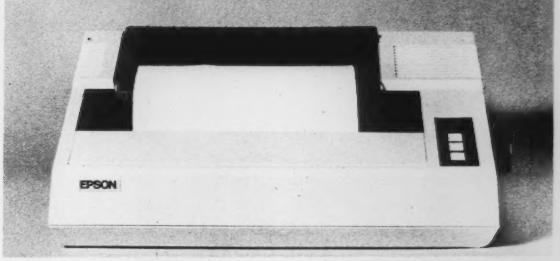

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asks, "Can you spell CAT?" If you spell it correctly, key by key, the voice responds with "That is correct," and asks you to spell a second word.

If you spell CAT incorrectly, the voice says, "Wrong. Try again." You get one more chance, and if you are wrong the second time, the voice says, "That is incorrect. The correct spelling of CAT is C...A...T." Then it gives you a second word to spell, such as *day, two,* or *milk.*

If you don't understand the word you are supposed to spell, press the key to the left of the LEVEL key, and the word will be repeated.

Press the LEVEL key a second time, and the voice says "Level Two selected," and gives a longer word, such as *mother,*

The Original Talking Typewriter

David H. Ahl

The original Talking Typewriter was designed by Omar K. Moore while he taught at Yale University in the early '60's. My first contact with the device was when Omar joined the staff of the Learning R & D Center at the University of Pittsburgh in 1967.

By then, McGraw-Edison, to which Yale had assigned the patents of the Talking Typewriter, had built several dozen units at a cost of around $35,000 each. Five or six of them were at Pitt. Outwardly, the Talking Typewriter resembled a language learning carrel with an oversize electric typewriter on a shelf and a speaker overhead.

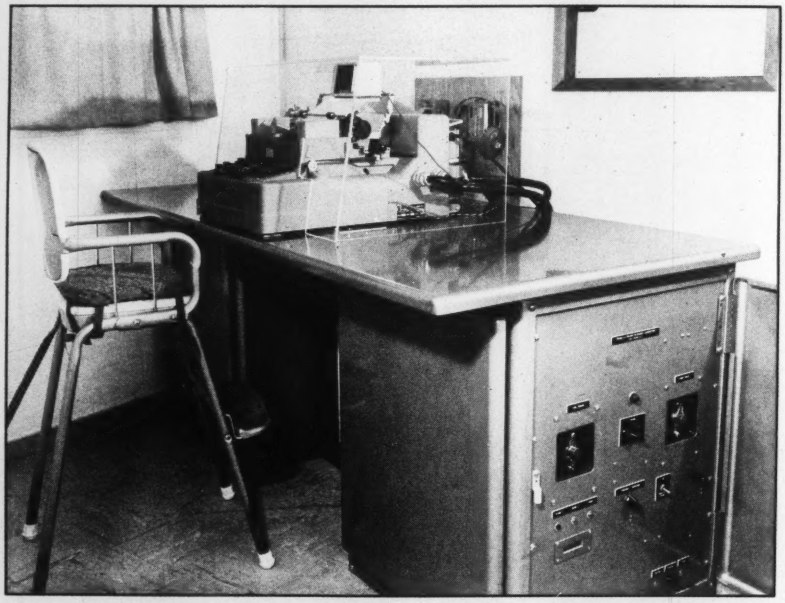
The device was developed as part of a long-term research program in psychology, language, mathematics, and learning called "The Clarifying Environments Program." The principal purpose of the Talking Typewriter was to help children learn to communicate effectively. It focused on two important steps: learning to read and learning to write.

The device had many programmable modes of operation. Initially, when a child first used the machine, it simply voiced the letter of the key that was pressed. Next, it would say a letter and the child had to press that key; indeed, it was the only key that would respond. Later, the child moved to words, phrases, and sentences.

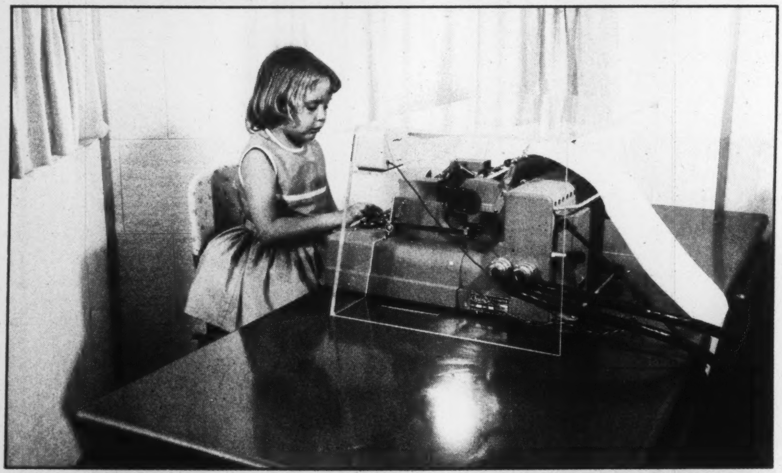
By the end of the second year of operation, the children using the Talking Typewriter had made enormous progress. They were even turning out their own "newspaper," weekly, as I recall. The three-year-olds gathered the news, the four-year-olds wrote the stories, and the five-year-olds were responsible for editing and layout. Astonishing! Imagine where these kids are today!

Because of its cost, the Talking Typewriter never gained wide acceptance in schools, and McGraw-Edison stopped making them. Although Omar is still a Professor of Sociology at Pitt, the Clarifying Environments Program has pushed into new areas focusing principally on disadvantaged children.

Perhaps with the technology available at very low cost today, some others will dust off the teaching/learning methodologies of Moore and his colleagues and put them back into use.



The very first Edison Responsive Environment (ERE) was built in 1963. Children quickly dubbed it the "Talking Typewriter."



The first Talking Typewriter was installed at the Hamden Hall Country Day School near New Haven, CT.

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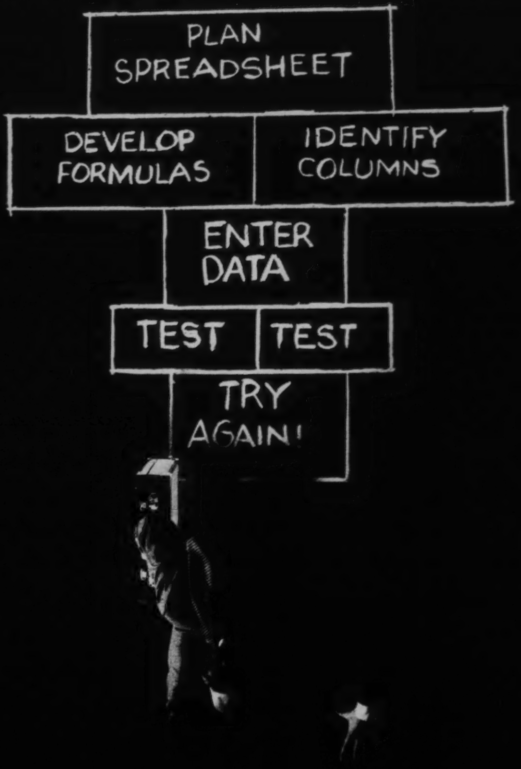

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friend, or *pocket*. Level Three has even longer words, such as *achieve, business,* and *typewriter.*

After you have tried spelling ten words, the typewriter announces your score and goes on to a second set of ten words.

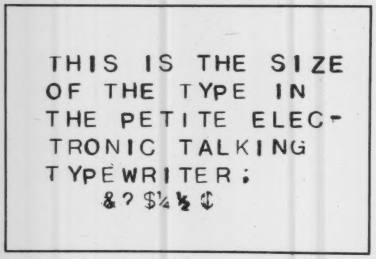
To listen to the entire vocabulary, hold down the FIG key and the spacebar at the same time, and the voice will recite the entire list of 160 words.

"When you are able to spell all the available words in my memory," the colorful manual says, "then we can consider moving on with an additional memory module available from your toy shop." This plug-in ROM slides onto the end of a printed circuit board located at the forward end of the battery compartment.

The Manual

The 32-page manual, printed in four colors, is very good, with many illustrations, large type, and all the details. It provides a drawing of the machine with callouts that identify all the exterior parts by name, shows how to insert paper, how to insert the four C-cell batteries, and tells exactly what each type of key does.

The manual notes that "if . . . you don't make any entry for 10 seconds, then I'll remind you of the word you are attempting by repeating it. If you still don't make an entry, I'll assume you have gone for dinner and switch myself off after about 2½ minutes.



THIS IS THE SIZE
OF THE TYPE IN
THE PETITE ELEC-
TRONIC TALKING
TYPEWRITER;
&?$¼½¢

Figure 2. The Talking Typewriter prints fairly well, and has several characters not often found on small machines.

The manual ends with instructions on how to change the ribbon cartridge, how to lay out a letter, a list of all the words in each level, and suggestions for various games to play with the machine, such as taking turns with another person to see who can go the longest without making a mistake.

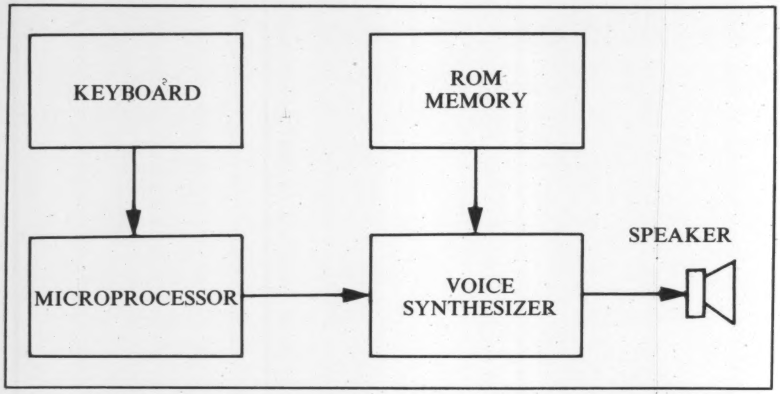


Figure 3. The block diagram for the Talking Typewriter is very simple, because the microprocessor and voice synthesizer perform many housekeeping functions that would otherwise require several more chips.

The Box

The box in which the Talking Typewriter is packed has some information printed on it that appears nowhere else: The typewriter may be operated by a six-volt AC adapter. It is recommended for children of four and up. The keys print in lower case in the United Kingdom. The ribbon prints over 30,000 characters.

Designed for both the U.S. and Canadian markets, the box is printed in both English and French. Thus the typewriter is also called "La Machine à Ecrire Parlante Electronique."

How It Works

The Petite Talking Typewriter is based on a variation of the Texas Instruments "Speak and Spell" voice-synthesizer module (also called a speech generator) made in Hong Kong under a license from TI.

The block diagram is very simple. When the machine is switched on, the microprocessor scans the keyboard several thousand times a second to see which key has been pressed. (No information is available on what type of microprocessor is used.)

When a key is pressed, the microprocessor decides which letter has been selected and signals the voice-synthesizer chip. The microprocessor also keeps track of the user's spelling mistakes.

The voice synthesizer asks the ROM memory for the combination of bits required for the letter or number selected at the keyboard; the ROM contains the 160-word vocabulary in the form of 128,000 bits of encoded speech data.

The synthesizer then sends the group of bits though a digital-to-analog converter, and the waveform is amplified and sent to a 2¼" speaker that reproduces the sound of the letter or number.

The synthesizer also contains a clock that times the speech; delays are inserted between letters and words to space them out and thus make the phrases sound more lifelike.

Where It's Made

Press the key for the last letter of the alphabet, and the British-accented voice says, "zed," not "zee," because the Electronic Talking Typewriter is made in Nottingham, England, by Byron International, manufacturers of toys and an inhaler device for asthmatics.

Byron is a division of a highly diversified $450 million conglomerate, Dobson Park Industries Ltd., also of Nottingham.

The Talking Typewriter is marketed in the U.S.A. by Wesco International, which manufactured toys in the U.S.A. for many years, but no longer does. Wesco's first relationship with Byron was as the U.S. distributor for its products; it is now a wholly owned subsidiary of Byron.

Wesco markets other toys, including a talking cash register, several sewing machines, three children's typewriters, and the Sindy line of dolls.

According to the Wesco catalog, "the real benefit" of the Talking Typewriter "to the child and the parent is that they can see the mistakes typed before them, and they actually have a hard copy." The catalog notes that the Word Challenger add-on vocabulary unit adds another 140 words, and that it "gives six levels of difficulty and an amazing choice of commonly misspelled words, teasers and mind bogglers."

The Electronic Talking Typewriter was $129.95 last Christmas at F.A.O. Schwartz in New York City and has been offered at Toys-R-Us for $79.95. If you can't find the typewriter in your area, it is available from Wesco International Inc. (2218 Enterprise Ave., Jackson, MI 49203) for $79.95. ☐

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CIRCLE 277 ON READER SERVICE CARD

A Very Friendly Database Program For The Apple

Terry Harmer

There are currently dozens of database programs written for the Apple II computer. They range all the way from simple "file card" types, to multi-file relational systems costing many hundreds of dollars. The majority of them fall somewhere in the middle of this range, and this is where the competition is most intense.

The variety of features and prices makes choosing difficult. You must match features with needs, of course, but you must also try to find a program that you will still like six months or a year down the road—and one that is continually being updated so it will not become obsolete.

In terms of a database program itself there are many more questions to answer. Is the program simple or complex? Does it *appear* simple or complex (a rather different thing). Is it easy or difficult to learn? If it is difficult to learn, is the effort required justified by the performance? The answers to these sorts of questions will determine whether the program languishes on your shelf or becomes a much-used and trusted friend.

In many ways learning to use a database program (and other computer programs as well) is much like making a friend. You expend a great deal of time, effort, and psychological energy before you knew whether the program (or the friend) will turn out to be worthwhile.

If you discover something in a database program that is a bother, you will probably have to put up with it. Reading the documentation will not tell you how good a friend your program will become because most annoyances become such only through repeated use.

The newest database program from High Technology Software is *Information Master,* version 5.2, a program that falls squarely in the most competitive price range. In addition, there are two accessory programs that enlarge its functions and capabilities. The complete three program set consists of the following:

Information Master costs $150 and includes Data Entry, Data Modification, Report Generation, and Backup Utility modules.

Data Master version 3.5 costs $100. It includes programs to reorganize and transfer data, rename a system, modify a field type, and transfer format files.

Transit version 3.0, which costs $50, is a file translator.

creative computing

SOFTWARE PROFILE

Name: Information Master;
Data Master; Transit

Type: Database and utility software

System: Apple II+, IIe

Format: Disk

Language: Basic

Summary: A good choice for use on less than 1000 records. Excellent error handling and ease of use.

Price: Information Master, $150
Data Master, $100
Transit, $50

Manufacturer:
High Technology Inc.
Software Division
2201 N.E. 63rd St.
Oklahoma City, OK 73113

With these three packages you can do almost anything you wish with your data. The screen formatting, while at times rather unusual, is neat, attractive and clear. Most commands are single keystroke (not requiring RETURN), so movement through the programs is fast and sure. Error checking on input is for the most part accurate.

Overview

The documentation subsequent to version 5.0 of *Information Master* has been extensively rewritten. There is now a complete tutorial section as well as a reference section. Instead of providing a sample file, the tutorial shows you how to create your own sample file from scratch. Starting from a very simple file, the features of *Information Master* are

---

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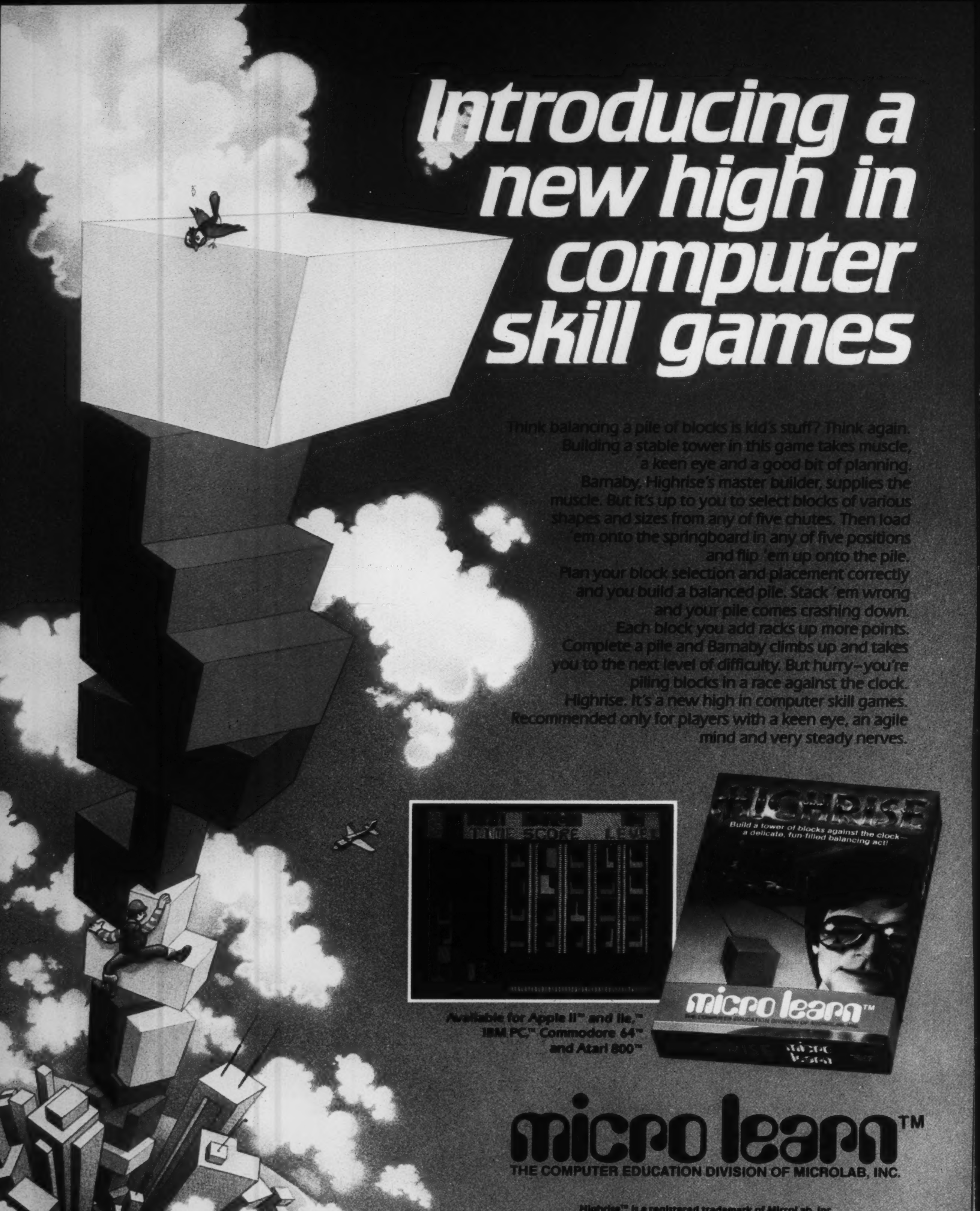

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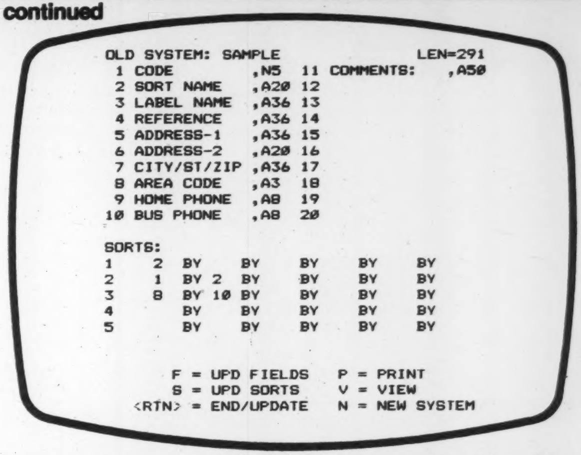

```
OLD SYSTEM: SAMPLE                         LEN=291
 1 CODE         ,N5  11 COMMENTS:     ,A50
 2 SORT NAME    ,A20 12
 3 LABEL NAME   ,A36 13
 4 REFERENCE    ,A36 14
 5 ADDRESS-1    ,A36 15
 6 ADDRESS-2    ,A20 16
 7 CITY/ST/ZIP  ,A36 17
 8 AREA CODE    ,A3  18
 9 HOME PHONE   ,A8  19
10 BUS PHONE    ,A8  20

SORTS:
1     2  BY    BY     BY     BY     BY
2     1  BY 2  BY     BY     BY     BY
3     8  BY 10 BY     BY     BY     BY
4        BY    BY     BY     BY     BY
5        BY    BY     BY     BY     BY


       F = UPD FIELDS    P = PRINT
       S = UPD SORTS     V = VIEW
   <RTN> = END/UPDATE    N = NEW SYSTEM
```

Figure 1. Create/Modify System Format.

gradually introduced. The writing is clear and readable.

Sample screens are printed at important points so you can compare what is on your screen with what is in the manual. An index is provided.

The *Information Master* program is well thought-out and complete. A great deal of effort has gone into screen formatting and keyboard use. The programmers at High Technology Software understand how people use a program. You can go away for three months, and when you come back to the program you don't have to re-study the documentation to use it. That is a sign of careful design.

For example, the Create/Modify System Format screen, which displays the complete system format, all fields, their lengths and types, all the sorts and sub sorts, record lengths and so forth, is shown in Figure 1. There is an enormous amount of information on this page, yet it is clear and readable.

"Special" Features Standard

The back-up utility of *Information Master* is called Transfer Files. It is a function of this module to make back-up copies of your data. In most database programs this function simply copies the disk, either by file name or by disk track. Not so with *Information Master.*

This utility will transfer either the entire file (complete with all your data) or only the system format (the file definitions as well as the report and sort formats but no data). Such a system (without data) can be easily modified, adding or subtracting fields or changing field types from within the basic *Information Master* program itself.

This is a very simple way to create a system similar to one you already have. You transfer the files without data, then make any changes in the file structure you want, and you have a new file.

If you just want to transfer data to another disk, Transfer Files does that easily. The program reads a series of individual records from the source file and then writes that group to the destination file. This provides a good check of file integrity since each record in the file is individually accessed and inspected.

If the program finds a bad record, it intercepts it, marks it, counts it, and writes it to the destination disk with *BAD* written in the first five positions of each field in that record. When the transfer is complete the program tells you how many *BAD* records it found. You can then go through your file and using the global editing feature delete those records. You will lose the *BAD* records, of course, but not the rest of your file.

Another example of extra value is the inclusion of global record editing in the Information Master program.

Another feature not included in most database programs is almost a requirement for mailing list applications—the ability to close up unused lines in a mailing label format without losing track of where the top of the next label is. Where most programs leave an unused line blank, *Information Master* closes up the blank address line and adds that line to the bottom of the label so the total line count remains the same.

Another example of extra value is the inclusion of global record editing in the *Information Master* program. Global editing is the ability of the program to go through its entire file looking for records that you specify and either delete them or change a field according to your specifications. Using this feature, you can make massive changes to your files easily and automatically.

Another unique feature is called a print-time variable. This is a variable that you specify when a report is printed. For example, if you wanted to use the finance charge amount as a print-time variable for your accounts receivable report, you would first tell the program what question you wanted it to ask when it printed the report, e.g., ENTER FINANCE CHARGE PLEASE? When it is time to print the report, *Information Master* will print on your screen that request for information and wait for you to type in the answer. The number you enter is used for any calculations that involve that particular variable when the report is printed.

For example, your finance charge may normally be 1% of the unpaid balance. If you made this a print-time variable, the program would ask you what finance charge you wanted for this particular report and you could answer with any number. This gives "what if" capability to a database program.

There are many other helpful features in the *Information Master* program as well as many little enhancements and details that make it an exceptional value. Some features just seem to appear when you need them. When modifying a report format, for example, your new format is saved upon exit. What if you change your mind? What if you can't remember how the report was before you started to change it around? How do you get your original report format back without having to rebuild it?

I was staring at the very first of the modification screens in exactly this position, wondering what to do when I decided to press the left arrow once more. The message IGNORE ALL CHANGES Y/N? appeared. It was as if the program had been reading my mind. It does not take many of these touches to make a program *my* friend.

Limitations

One of the reasons for the quality of the *Information Master* program aside from the skill of its authors is that they have limited their goals. By not trying to be all things to all people they are able to polish and hone to perfection. Chief among these chosen restraints are number of records (1000 or disk capacity), number of fields per record (20), Apple DOS, six sorts (with five sub-levels in each sort), and ten lines per record for reports.

These limits are a compromise between system capability and human needs and seem to be well chosen.

This program is not for the impatient, however. There are points at which you sit tapping your fingers waiting . . . waiting . . . waiting . . . for something to happen. For example, the wait is about 40 seconds for the PRINT FORMATTED REPORT module to initialize. After that everything else moves along smoothly. Informational messages appear on the screen if anything unusual is about to happen and these messages are constantly updated so that you know the program is still running.

Data Master

The second program in the family is *Data Master.* This is basically a file restructuring utility.

The program takes two dissimilar files and transfers data from one to the other. This means that you can take any file and transfer parts of it to any other file. Thus, you can add or subtract fields and change field lengths or types without having to re-enter data.

If this were all it did, *Data Master* would be a useful and valuable utility, but it does much more. It allows you to reorganize your data while you transfer it. This turns it from a useful utility into an exceptional one.

For example, you can do math operations on your data and put the results into new fields. But the really creative feature allows you to take any part of a field or fields (a character or group of characters) and add them to any other field. You could, for example, take parts of several fields, combine them, multiply by another field, subtract a constant and put the result into a new field. The feature is both effective and useful.

The second function of the *Data Master* program is to allow you to rename a system (file) and its associated report, sort, and index files with one stroke. This is very convenient and fast when you have the same file on several disks and want to change the name on all of them—CHECKBOOK 1982 to CHECKBOOK 1983 for example. It saves a great deal of renaming.

You can also change a field type very quickly and simply with this program. You can change any field from any type to any other type (alpha, numeric, dollars/cents). You may get strange results changing alphabetic fields to numeric ones, but you are allowed to do it.

> ***Unfortunately you cannot use* Transit *to put* Information Master *files in formats readable by other programs.***

The final function of the *Data Master* program is to transfer newly created or modified report formats to all the disks on which their systems reside without affecting the data on those systems. This doesn't sound like much, and you probably will not use it often, but it will save you an enormous amount of time if you ever need it, because you won't have to recreate the report formats for each disk. You just set up your formats and the program transfers them to all the disks you request.

WE'RE IN TROUBLE
chase

"We're in trouble!"

Transit

The second accessory to *Information Master* is *Transit.* This companion program allows you to translate almost any Apple DOS file into a file format that *Information Master* can understand. It writes the format and then transfers the data. If you have a data file created by *File Cabinet* for example, you could use *Transit* to turn it into an *Information Master* file. Thereafter you would use *Information Master* to add, modify, print or otherwise manipulate the data.

You could take a file created by a program written by a friend and convert it to an *Information Master* format with *Transit.* You could then use *Data Master* to add some fields of your own and delete some you don't need. Finally, using all the facilities of *Information Master* you could search, sort, edit, and print the file in any way you wanted.

Unfortunately you cannot use *Transit* to put *Information Master* files in formats readable by other programs. *Information Master* files are in standard Apple DOS, however, and the documentation provides the *Information Master* file formats. This makes it possible to write Basic programs that access *Information Master* files and allows you to write programs that translate *Information Master* files into formats for other programs.

Transit has one problem—it may (very rarely) hang when "building system." This is what actually happens. Just before the program tries to "build system" it needs a fresh disk to which to write your new system, and it intends to initialize whatever disk you give it. Before it does the initialization, however, it takes a peek at the disk to see if you are about to destroy something important. If it sees a blank disk all is well. If it sees a normal DOS disk all is well. If it sees *almost* anything else all is still well.

There are, however, some very strangely formatted disks, and occasionally one of these will provide *Transit* with some strange data. *Transit* may then do one of two things when it begins to set up the format definition files. It may build the system file endlessly until the disk is full (at which point you are informed of this fact and gracefully returned to the menu), or it will spin the

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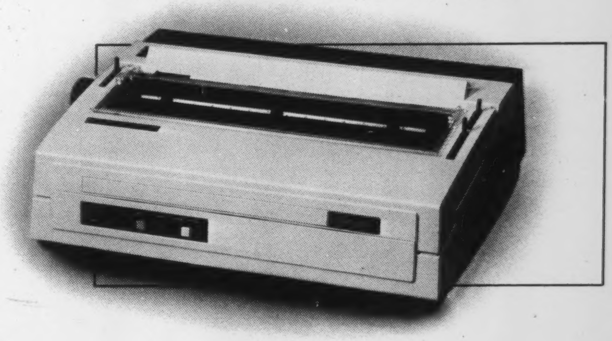

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CIRCLE 221 ON READER SERVICE CARD

disk endlessly trying to write a file that is never longer than one sector.

The solution is simple. Just use another disk, initialize the disk with Apple DOS or erase the disk with a bulk eraser or degaussing utility. This problem seems to occur mostly with disks that have been used as *DB Master* data disks.

All in all *Transit* is a very helpful utility. The documentation alone will give you a nice introduction to file types and structures.

Summary

The basic feel of these programs is one of relaxation and flowing smoothness. Nothing is jerky, abrupt, surprising or disconcerting. Informational messages appear on the screen if anything unusual is about to happen and are constantly updated so that you know the program is still running.

These High Technology programs definitely live in the real world. They are designed for people. We constantly make mistakes, fail to plan ahead, and do various and sundry other unpredictable things. *Information Master* is designed and written with this type of behavior in mind.

Information Master is a program that gets better and better the more you use it. Once you have familiarized yourself with the program, you almost never have to refer to the documentation again.

Everything in the program is easily accessed. Reports can be altered immediately, sorts changed or eliminated, and selection criteria specified—all with ease. The apparent simplicity of the program bespeaks its sophistication. You can move back and forth through the various parts of the program easily. Screen formatting is clear, uncluttered and concise.

Flies In The Ointment

Although I could find no "bugs," in any of the programs, there are things that I wish could be included or changed. Here is my wish list for *Information Master*:

- I wish there were a way to control your printer from within the program. If you need 132 columns or emphasized print, you must set up your printer before you boot the program disk.
- I wish there were a way to store selection criteria, printer control strings, and print options for specific reports. These must be specified each time the report is run. It would make reports flow much more smoothly if you didn't have to enter these items each time.
- I would eliminate the CTRL-G "beep" which accompanies each record entered; it is annoying and completely unnecessary.
- I would like to be able to decide whether *Transit* will initialize a disk or not. Then I could transfer more than one file to a given disk.
- I would like to be able to print out report formats. Currently you have only your planning sheet for reference. Since most people will just dive into the program and "wing it," having some way to print out what you have set up would be very helpful.
- I would eliminate the automatic formfeed at the end of reports, system printouts and so forth. I would like to be able to put several system formats on a single sheet of paper. As it is, I just pull the paper off the tractor pins and wait while the program steps through 40 or more linefeeds.

At $300 for the three modules this system is not cheap. But it is, in my opinion, the very best database available if you have a relatively small number (less than 1000) records. I recommend it. ☐

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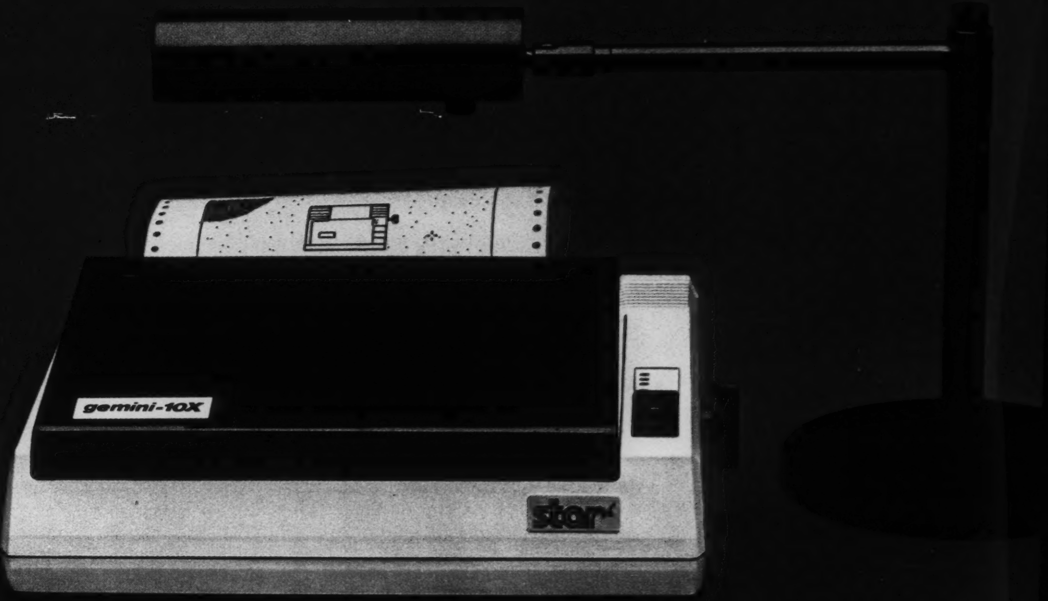

WordPlus—PC

An Easy-To-Learn Word Processor

Joe Devlin

WordPlus—PC is a full-feature word processor for the IBM Personal Computer from Professional Software. The chief advantage of *WordPlus* is that it is extremely easy to learn to use. This is accomplished through the use of color-coded function key labels and extensive screen prompts that save you from having to memorize complicated word processing codes. The chief drawback is that the software can be annoyingly slow in performing some routine applications.

Although the package is new to the IBM, a closely related package called *WordPro* has been distributed by Professional Software for Commodore computers for some time. Although *WordPlus* and *WordPro* have a very similar look, I am told that *WordPlus* is a completely new package and not a conversion of the older Commodore package.

creative computing

SOFTWARE PROFILE

Name: WordPlus—PC
Type: Word processing
System: 64K IBM Personal Computer and compatible printer
Format: Disk
Language: Machine
Summary: Full-featured and easy to use but sluggish
Price: $395
Manufacturer:
Professional Software, Inc.
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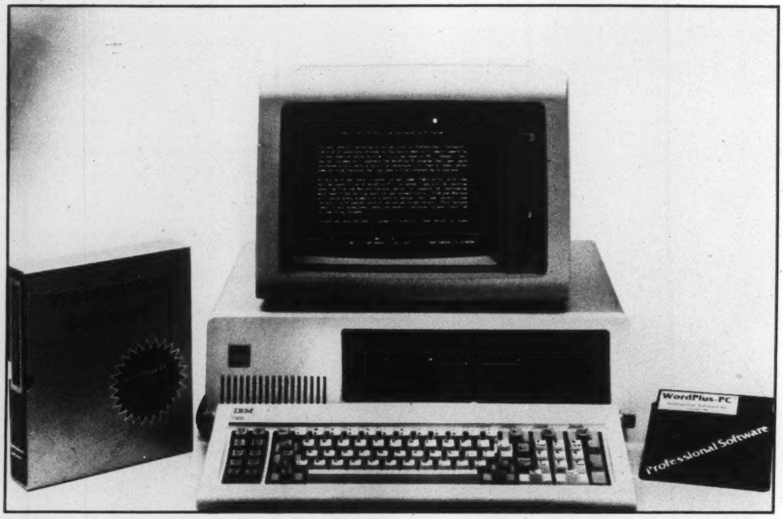
Needham, MA 02194



WordPlus comes packaged in a box that includes the user's manual, a disk, a reference card listing the major word processing commands, and two sheets of stick-on labels. It is the stickers that make this word processor so easy to learn to use.

The first sticker is red and is placed over the Alternate key found at the lower left of the IBM keyboard. A green sticker is used to cover the left SHIFT key. The remaining stickers are applied to the ten IBM function keys.

Each function key sticker has three color-coded commands printed on it. These indicate which word processing commands can be accessed by which key. The most commonly used word processing commands are printed in blue and are accessed by pressing the appropriate function key once. Press key F7, label INST MD in blue, and the program will insert text wherever the cursor is placed.

Commands that are used less often are printed in red or green and are accessed by pressing both a function key and either the red Alternate key or the green SHIFT key. There is a help function that can be used when commands have been forgotten. A stroke on the key labelled Help will call forth a list of keys and commands. If problems persist, there is a toll free customer support number you can call. I found the phone staff to be patient, well informed, and supportive.

Features

WordPlus has many nice features. It is a full screen editor, which means that you can reach any part of the text simply by using the cursor control keys to scroll where you want to go. All the features normally expected in a word processing

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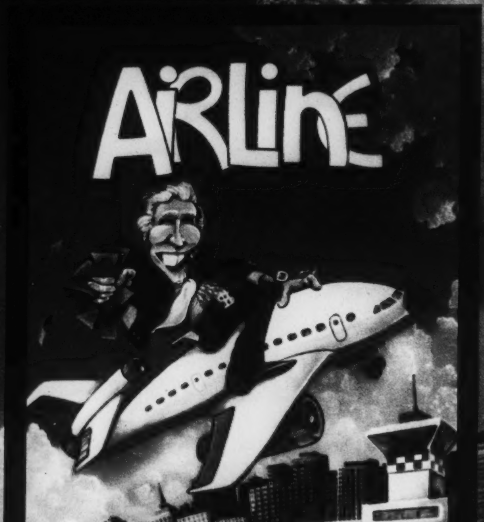

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package are here. The list of major functions includes text insertion and deletion, search and replace, personalized form letters, headers and footers, boldface and underlining, and automatic page numbering. You can print one document while you edit another.

WordPlus can also merge information from other documents or other programs such as *VisiCalc.* The user's manual includes a well written tutorial section, a reference section describing each command in detail, and an index.

Two particularly nifty features of the program are the cut-and-paste and decimal alignment features. Cut and paste allows you to carve out a rectangular block of text (of any size) and move it to any other location within the document. This feature would be especially useful to anyone who organizes numerical information or text into columns or tables. Say you wish to reverse the positions of column A and B or perhaps you want table A inserted later on the report. Cut and paste makes the move a snap.

The numerical mode is used for aligning columns of numbers around the decimal point. In numeric mode, numbers are inserted and moved to the left of the cursor until a decimal point is hit. The first step in using the numeric mode is to use the tab to move the cursor to the spot where a column of numbers should appear. Next you hit a space or decimal point, and the characters begin to be inserted to the left. The result is that all the numbers in the column are aligned with the decimal spaces.

Built For Comfort Not Speed

Along with all the good features, the package does have some serious drawbacks. The biggest problem with the package is the amount of time it takes to perform some routine functions such as inserting and moving text. Let me outline the procedure moving this sentence to the paragraph below.

Hitting function key F6, labeled Range in blue, starts the process. In response, the bottom line of the screen will ask for the "Start of Range." Scroll the cursor over to the start of the sentence and hit the S; the bottom line will next ask for the "End of Range." Scroll to the end of the sentence and hit the E key to set the range. To insert the outlined sentence hit the Range key a second time. The prompts at the bottom of the screen will now ask if you wish to "Clear, Delete, Transfer or Insert" the sentence. Hit the T key and the program will gobble the sentence up, and the prompt will ask for the "Destination Of Text." Hit the D key and the line will reappear in the new location. Hitting the Range key a final time and typing the letter C for Clear will wipe out the range setting, and ready the software for the next transfer.

As you see, the simple task of moving a single sentence takes nine keystrokes not counting the scrolling of the cursor. In addition, it took the computer a full 30 seconds to gobble the sentence up from its original location and to move it to its new destination. This is not a word processor for people who compose on a word processor.

Another thing I dislike about *WordPlus* is that what you see on the screen is not what appears on the printed page. Margin commands, line spacing and other format commands are reflected in the printed output but shown on the screen only as inserted command phrases. During editing, the text always appears on the screen in 80-column format regardless of how it will appear when printed.

Special characters are also inserted into the text indicating word processing commands such as underline, boldface and carriage return. For example, to underline text you must insert two special characters into the text—a blue dot at the beginning of the bolding and a two sided arrow at the end. The result is that should you print out a document, make editing changes on the paper and then go back to the computer to enter your changes, the mistakes will not be in the same place on the screen as they were on the printed page.

Two particularly nifty features of the program are the cut and paste and decimal alignment features.

The Program For You?

Is this the word processing package you should buy for your IBM PC? The answer depends upon your needs. If you are looking for a word processor that is easy to learn to use, and if you will use it primarily for routine typing, form letters, and jobs in which the cut and paste operation and the decimal alignment functions will see a lot of use, then maybe so.

If, on the other hand, you will use the word processor to make frequent small changes to text, this is not the package you are looking for. In this sort of use the sluggishness of the software and the number of keystrokes would probably drive you crazy in short order. ☐

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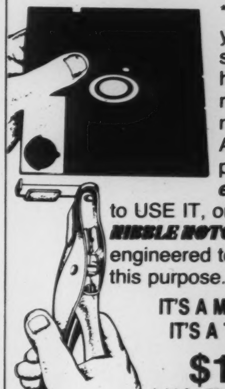

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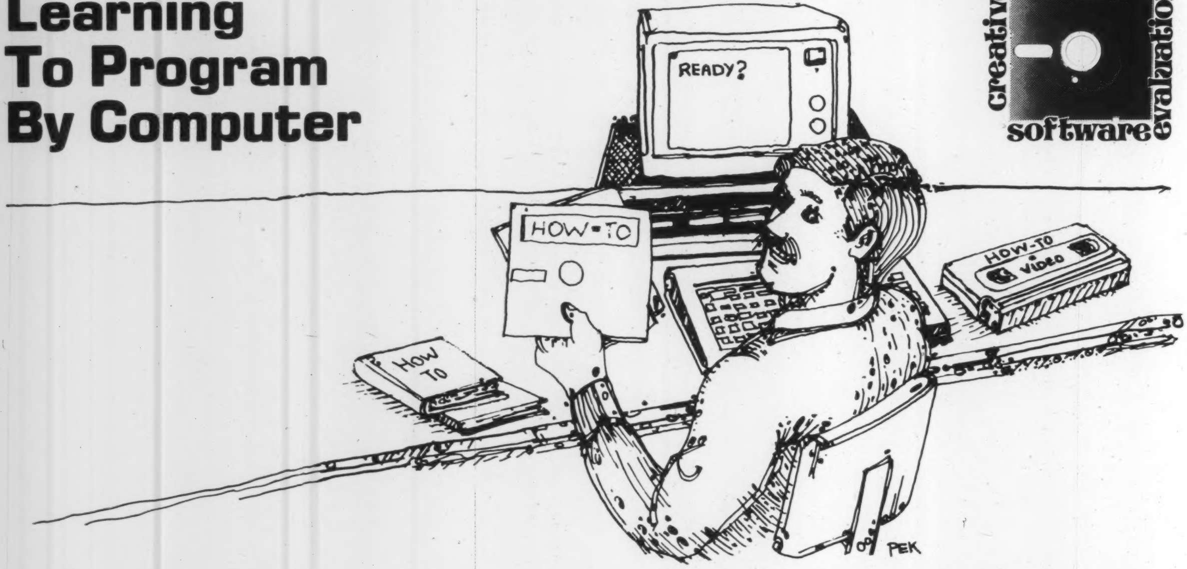
Learning To Program By Computer



Brian J. Murphy

Sitting before you is a newcomer in your life, a microcomputer.

You have read about the "computer revolution," learned about the educational advantages your children will enjoy with a home computer, and seen the great home budget applications, the games and so forth. Perhaps you have also considered taking a stab at programming.

For whatever reason, you made the big decision and now own a microcomputer. What you need now is the knowledge to use it.

Some people, when exposed to computers for the first time, tell themselves that it is too complex a subject, that they can never master an advanced technological tool like a computer. This is akin to telling yourself that you will never understand algebra—a form of self-fulfilling prophecy, an excellent way to precondition yourself to failure. The most important thing for you, the potential computer user, to understand is that if you are bright enough to drive a car and hold a job, you can operate and even program a personal computer.

Some people find that they "choke up" in the presence of a computer, as if they were in the presence of a mysterious, superior intelligence. This computer phobia strikes at home and in the office, making it difficult to acquire the knowledge you need to do your job or to learn more about your exciting and somewhat puzzling new possession.

Personal computers are designed to be easy to use at home and in the office. Yet it is important to find the best way to acquire the knowledge you need.

Instructional Materials

Focusing on the instructional materials available to Apple II owners (there seems to be more teaching material for Apple IIs than for any other system), we have learned that first-time computer users have more options than learning strictly from manufacturers' manuals or other print materials. There are options that mix print and electronic media, including videotapes, and audio cassette tapes, and computer media, including videotapes, audio cassette tapes, and computer media, including programs loaded from cassettes and disks.

> ***If you are bright enough to drive a car, you can operate a personal computer.***

First, let's look at the "by-the-book" method of learning. If you own an Apple II, you probably have an excellent set of Apple manuals which take the uninitiated from the first steps of physically setting up and powering up the Apple II system through the opening steps of programming. The best of the Apple manuals, the Applesoft Tutorial, accomplishes this with a common sense, hands-on, learning-by-doing approach leavened with occasional witty observations. If you are willing to follow the tutorial step by step, chances are you will learn how to program. The tutorial is friendly and supportive to the new computer user.

If you are uncomfortable with the Apple II documentation, many other very good manuals that will teach you how to approach your Apple for the first time and how to program it are available in bookstores.

If you need a simple introduction to the Apple II, *The Elementary Apple* (Datamost, $14.95, 1982) seems to fill the bill. The book approaches the subject in a manner that presupposes no previous computer knowledge. It takes you by the hand through the setup procedures, and shows you how to run prepackaged software and the first steps of programming. It is perfect for people with computer phobia.

Some manuals mix an introduction to the Apple with a more comprehensive tutorial on elementary programming. One of the better manuals is the *Apple II User's Guide* by Lon Poole, Martin McNiff and Steven Cook (Osborne/McGraw-Hill, $15, 1981). Like the Apple documentation, it nurses you through set up and provides the basic pointers to help you use your system. It examines the techniques of programming in detail, giving you a good beginner's knowledge of Basic as found on the Apple II. The book also provides an introduction to machine language.

Brian J. Murphy, 133 Post Rd., Fairfield, CT 06430.

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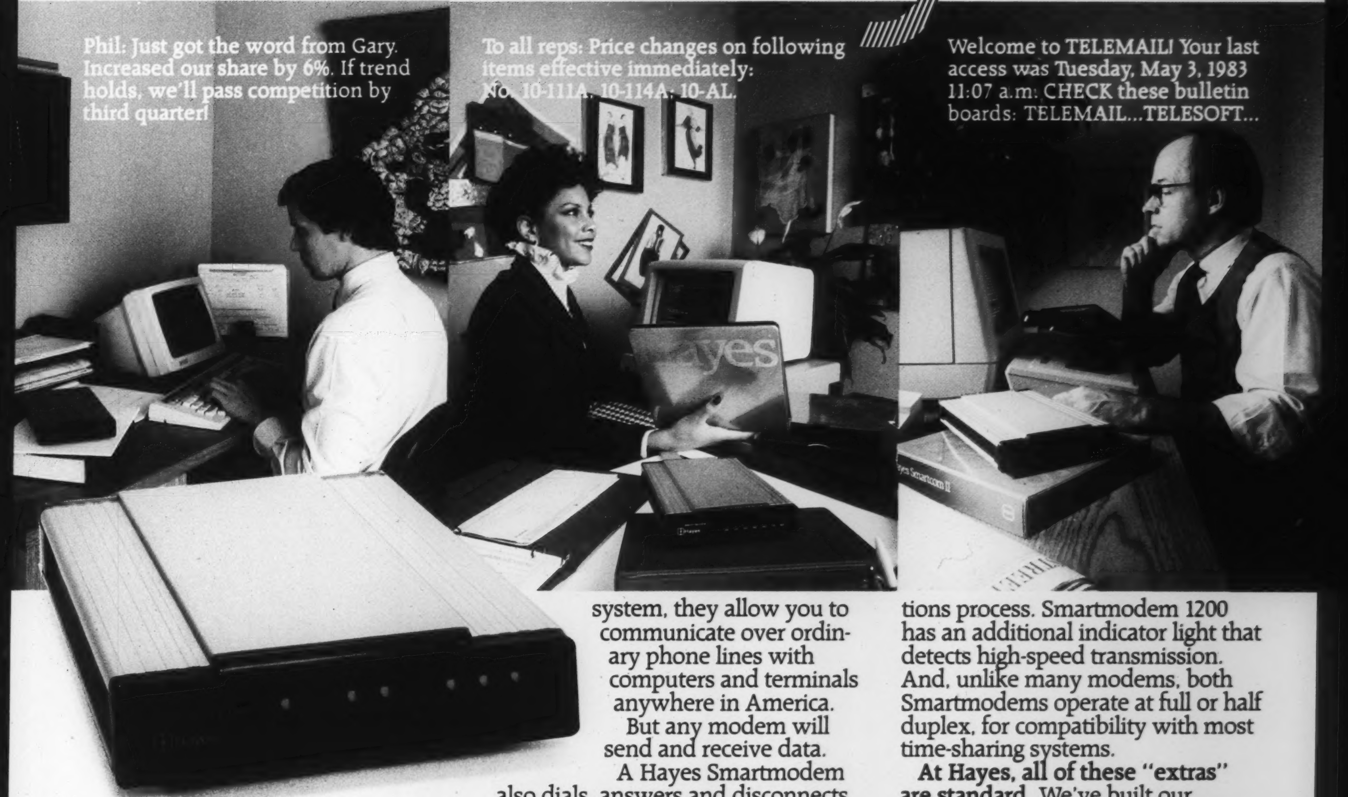

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For longer distances and larger volumes, Smartmodem 1200 operates at 1200 bps or up to 300 bps, with a built-in selector that automatically detects transmission speeds.

Both modems work with rotary dials, Touch-Tone* and key-set systems. We've even included an audio speaker and indicator lights so you can monitor the communications process. Smartmodem 1200 has an additional indicator light that detects high-speed transmission. And, unlike many modems, both Smartmodems operate at full or half duplex, for compatibility with most time-sharing systems.

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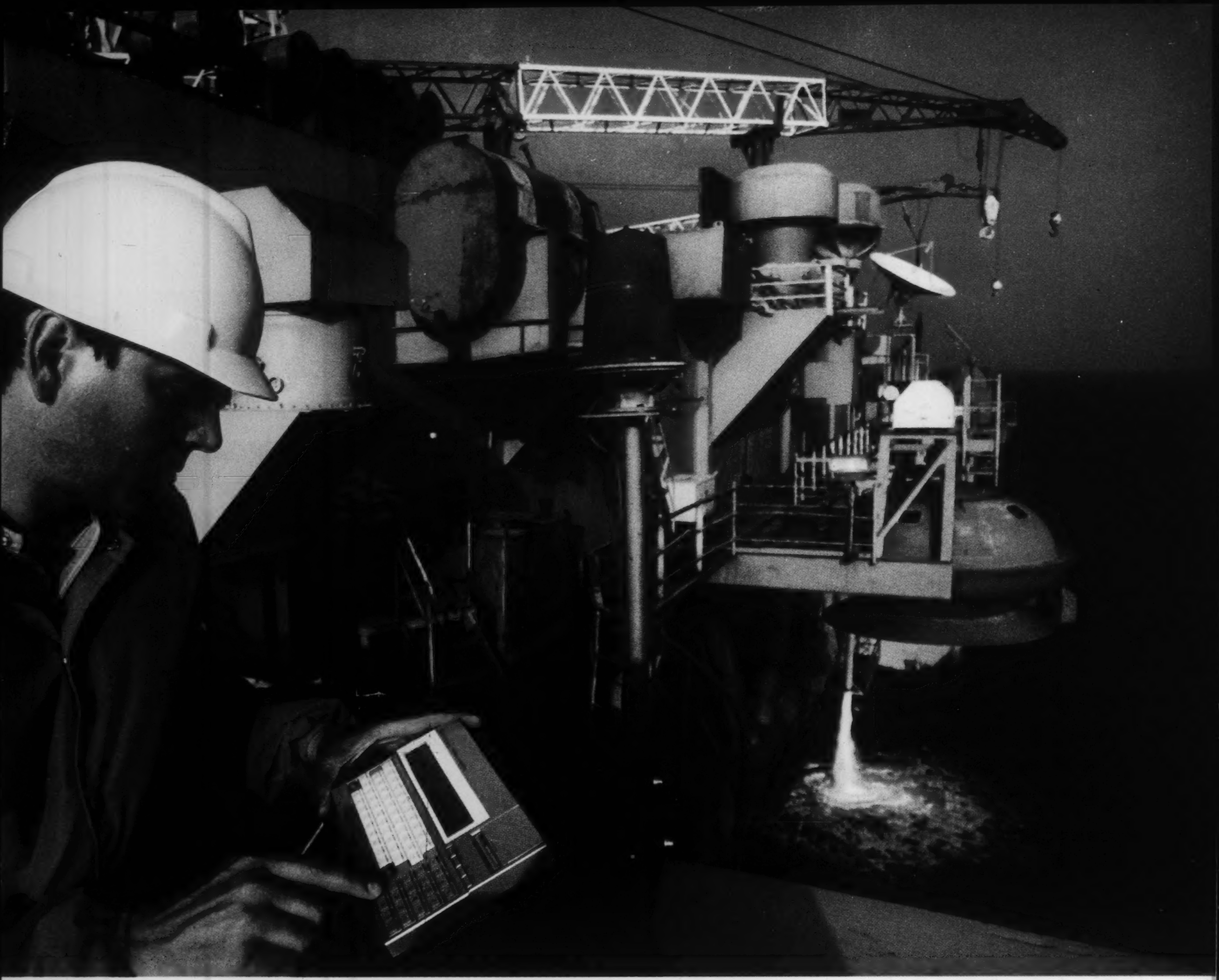

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COMPACT COMPUTER 40

If these books don't suit you, don't worry; a myriad of competitors crowds the computer shelf of any good bookstore. Some titles that caught my eye are:

- *Programming the Apple,* by J.L. Campbell and Lance Zimmerman. Robert J. Brady, $19.95, 1982. Covers Integer Basic and Applesoft Basic.
- *Applesoft Language,* by Brian D. Blackwood and George H. Blackwood. Howard W. Sams and Co., $10.95, 1981. Covers Applesoft Basic only.
- *Apple II Programmer's Handbook,* by Richard Vile. Prentice-Hall, $14.95, 1982. Covers Integer and Applesoft Basic, Pascal and 6502 Code.
- *Basic for the Apple II,* by Lary Joel and Martin Goldstein. Robert J. Brady, $14.95, 1982. A Basic tutorial.
- *A Guide to Programming in Applesoft,* by Bruce Preden. Lawrenceville Press, $12.95, 1982. Oriented to classroom and home study.

To determine which book will work best for you, spend some time thinking about how you go about learning. Leaf carefully through several manuals (not only the ones we have mentioned) before you pick one. Determine which seems easiest to read and to understand and best suited to your style of learning.

Teaching Packages

Let's sample approaches to understanding and programming the Apple II using various media, which supplement—and even replace—the manual. We will look at a selection of teaching packages using a variety of media. They represent a sample of what is available to Apple II owners and owners of other systems.

Assuming for a moment that you have been able to follow your Apple manuals well enough to assemble your system and that you have a disk drive, you may find *Know Your Apple* by Muse Software a valuable reference. Rather than a manual, this is a disk containing a program that mixes text and graphics to explain the most basic workings of your Apple II.

After you insert the disk in the drive and turn the system on, the program displays a title page on the video screen, then a picture of an Apple system and a series of five lesson titles (this is called a "program menu"). The lessons detail information on your monitor, disk drive and keyboard and examine the back of the Apple and the insides of the system. By hitting the space bar you can select the lesson you want to see; pressing the RETURN key begins the lesson.

The lessons themselves are very comprehensive, considering the minimum of text used. The monitor lesson explains the difference between using a computer CRT and a regular home TV for your video display and the differences between the text, low-resolution and high-resolution screens. Expert use of graphics gives you a dramatic A-B comparison between the two graphics screens.

The disk drive section explains how floppy disks work and how to care for them to prevent the loss of data. The lessons explain how information is organized on the disk, how it can be loaded from the disk into the computer memory and how programs in memory can be saved on a disk.

The Back of the Apple section is a short lesson covering the power on/off switch, the video and cassette jacks and the slots in the cabinet, which accommodate cords for peripheral devices such as disk drives and printers.

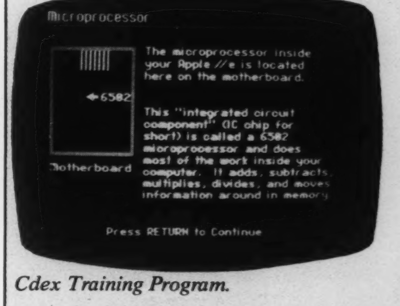
The Inside the Apple section is the most fascinating lesson, covering the location of the 6502 CPU, differences between ROM and RAM chips, and their location in the computer. The les-

Training Wheels for Your Apple IIe

Just before press time for the accompanying article, we received the *Cdex Training Program* for the Apple IIe. This is a three-disk set, with accompanying manual designed to teach the fundamentals of the IIe machine.

Although the accompanying manual is very helpful, you do not even need to open it to initiate the training program, and that, after all, should be the point of disk-based learning. Simply insert disk 1 and turn on your system, and the software will take it from there.

The graphics and text of the three disks are reminiscent of *Know Your Apple* from Muse, but much more thorough. Where *Know Your Apple* treats its topics rather superficially, and offers a disk that can be fully mastered in a few hours, the *Cdex Training Program* goes into much more detail concerning things like DOS commands and utilities, the differences between televisions and monitors, and the internal architecture of the Apple IIe. It will certainly take a few sessions to work through the material.



```
Microprocessor

        The microprocessor inside
        your Apple //e is located
        here on the motherboard.

 ←6502

        This "integrated circuit
        component" (IC chip for
        short) is called a 6502
        microprocessor and does
        most of the work inside your
Motherboard computer. It adds, subtracts,
        multiplies, divides, and moves
        information around in memory

      Press RETURN to Continue
```

Cdex Training Program.

The topics on disk 1 begin with a quick tutorial on using the training program itself. Other headings present introductory material to help the new user start feeling comfortable around the machine, such as a look at the Apple IIe keyboard, and an overview of a complete IIe system.

Disk 2 outlines the editing capabilities of the system, including the cursor movement keys. It then provides an expedition into simple DOS commands and a look at Applesoft Basic. This disk also includes sections that contain a more in-depth view of the internal architecture of the Apple, and the whys and wherefores of DOS parameters.

Disk 3 gets to some advanced topics. It explains advanced DOS commands, as well as DOS utilities, including Muffin, FID, Boot 13, and Master Create. Even I learned something new here. Other headings on the disk cover the topics of alternate operating systems (CP/M and UCSD), and alternate programming languages (Pascal, Logo, Pilot, Fortran, and Cobol). These areas are necessarily sketchy. The final heading on the disk covers peripherals for your Apple, ranging from printers to hard disk drives.

The looks and style of the *Cdex Training Program* are very professional, and seem to have been executed using *The Graphic Solution* from Accent Software. Each tutorial segment uses graphic and sound effects in just the right balance. Though the program does prompt for and then incorporate the user's name, this feature is not overplayed, as it is in other programs. Every heading is followed by a titlecard listing the branches available from that node, and the option is offered from that point to choose one branch or back up to the main menu. Even a novice will begin to feel comfortable with the concept of branching menus by the time he reaches disk 3 of the program.

In addition to all this, interactive exercises are provided on disk, as well as reinforcement exercises in the accompanying manual.

Even though I am not the biggest proponent of on-line tutorials you are likely to ever hear from, at $60, I was impressed with the *Cdex Training Program* for the Apple IIe. It is very handsomely packaged, and would certainly make a fine gift for a new Apple owner.

For more information, contact Cdex Corporation, 5050 El Camino Real, Los Altos, CA 94022. (415) 964-7600.—*JJA* son also discusses uses of peripheral slots, where game paddles, cassette cords and cables for video monitors are placed, the location of the power supply, and the location and use of the speaker.

The final lesson covers the Apple keyboard, explaining the difference between numeral 0 and letter O, what characters must be keyed in using the SHIFT key, the function of the CONTROL and ESCAPE keys, how the arrow and REPEAT keys are used, and the functions of the RESET and RETURN keys.

Know Your Apple makes a good introduction to the system. It gives you all the information you need to know to use your Apple without "getting technical." The graphics are very good, greatly enhancing the lessons.

VHS or Beta Format

If you have a videocassette recorder, a better introduction to the Apple is *How to Use Your Apple II In Ten Easy Video Lessons,* published by Stoneware Incorporated and Kennen Publishing. The producers of this tape (VHS or Beta format) have managed to cram a comprehensive tutorial in a program only an hour and forty-three minutes long. This outstanding video program is almost as good as a classroom tutorial—with the added benefit that it is endlessly repeatable for those who don't absorb all the information it has to offer in one viewing.

Television illustrates the material in moving color images.

The tape covers all the material mentioned on the Muse disk, but it does so more vividly thanks to television, which illustrates the material in moving color images. In addition to the basics, the tape shows you, in step-by-step fashion, how to set up your system and to ensure that all is well before you power up for the first time.

The tape also illustrates the various peripheral devices available for the Apple, including game paddles, printers, disk drives, phone modems and graphic tablets, among others. In addition, the tape illustrates the workings of the disk system, explaining what DOS is and how it helps the computer retrieve program data from a disk and how it saves program data to disk. In very graphic form it then demonstrates the procedure for booting a disk, examining the disk catalog and loading a program from the disk into the computer memory.

After a discussion of applications software (pre-programmed software packages like *VisiCalc* and *Apple Writer),* the taped program offers an elementary introduction to programming. The section covers some of the basic operating and programming commands including NEW, HOME, LIST, PRINT, GOTO, INPUT and END. It covers the difference between immediate and deferred execution of commands, native arithmetic functions of the Apple, linking print statements on the same line, automatic numerical ordering of program lines, loops, and creating variables in conjunction with input statements.

The best part of this package is that the videotape visually guides you through hands-on experience operating the Apple II and programming. Moreover, the novice is not rushed through the lessons. As you are prompted to perform various tasks on the Apple II, a pause is signaled at appropriate moments, using a special screen symbol and a series of beeps. At that signal, you hit the pause switch on the VCR and then complete the example as shown on the screen.

When a pause is signaled, the TV screen shows the program line being used in the exercise, allowing you to key it into the computer exactly as shown on screen. After each exercise, the video program carefully explains the point of the exercise and the functions of the various program commands.

The Stoneware video instruction package is a very powerful tool for learning. The approach to the subject is orderly, concise and friendly. This program is ideal for the average first-time computer user and a real blessing for anyone suffering from computer phobia. The video program demystifies the Apple II and systematically builds your confidence. The package lists for $120 and is available in VHS and Beta formats. (Instructional video cassettes for the Apple III and the IBM PC also are available from Stoneware.)

An alternative videotape for the beginning computer user is *Computer Fundamentals and Beginning Programming,* produced by Avion Video Computers. The tape reviews most of the elementary operational functions covered in the Stoneware production and covers some of the simpler programming topics, including screen output and use of numeric and text variables. It seems to be a nice way to get your feet wet as a programmer, though the coverage is not comprehensive. The tape is available in VHS and Beta formats for $69.95.

Assuming that you have mastered the basics of operating your Apple II, you should be ready and eager to tackle a comprehensive beginner's programming tutorial so that you can start writing your own software programs. If you are still reluctant to work strictly from a manual and feel more comfortable having things explained to you, then a workable alternative would be an audio cassette.

Audio Cassette

The New Step by Step, by Program Design Inc., mixes audio cassette instruction with disk-loaded tutorial material. The package, a tutorial for beginning programmers in Applesoft Basic, consists of four cassettes containing ten audio lessons, two disks with software to back up the audio lessons and a workbook.

To use the package, you run the disk program and play the audio tape simultaneously. The audio tape prompts you when and how to advance the computer program to the next block of material. Each of the ten audio lessons is extensively illustrated on the video screen.

The materials cover a wide and representative selection of basic programming skills. The course begins with some basic concepts, including the uses of the PRINT command with numbers and text, how the Apple does arithmetic, how and why program lines are numbered, deletion of program lines, and error correction.

Hands-on experience is indispensable in learning programming.

The package explains the creation and handling of variables, program loops, program counters and the library functions of Applesoft such as ABS (convert to absolute value), INT (convert to a whole number) and so forth. Next, the student learns how to access subroutines and return to the main program, to create and read data lines, to create FOR - NEXT loops, and to create and handle arrays of variables.

The concluding lessons give the student basic instruction on using the low-resolution graphic screen of the Apple. The last lesson offers a rare moment indeed, an explanation of scientific notation in a way anyone can understand.

Little quizzes designed to review and reinforce the concepts covered frequently interrupt the program. When it is time to answer review questions, you have the opportunity to stop the audio tape and take your time considering an answer. At the end of most of the lessons

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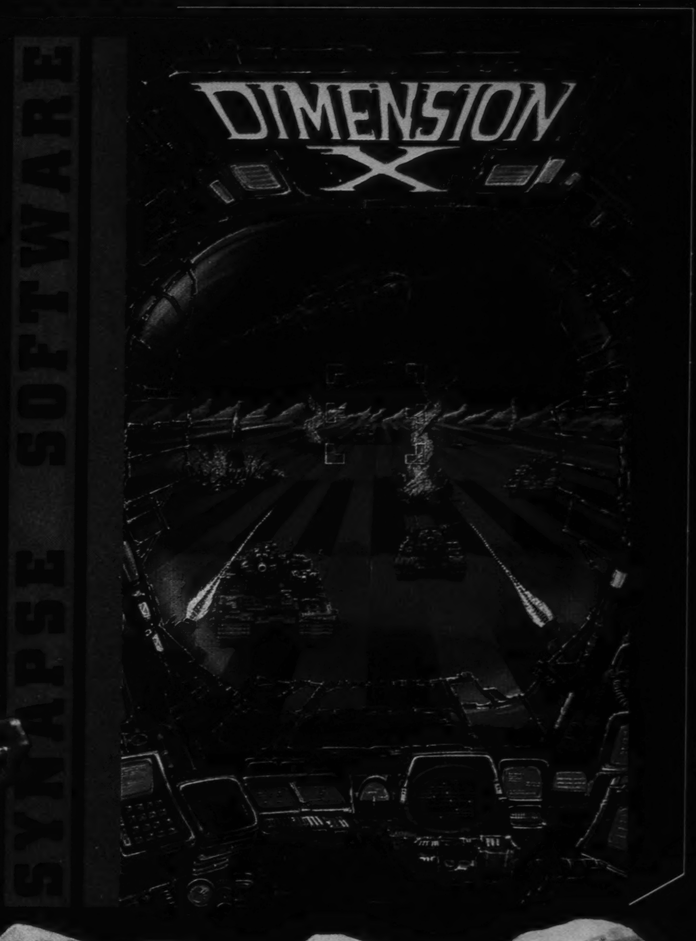

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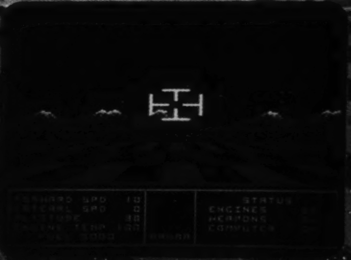

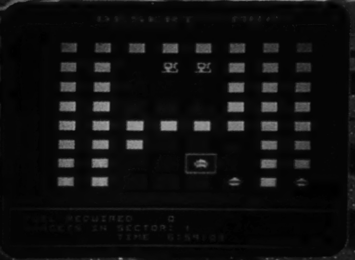

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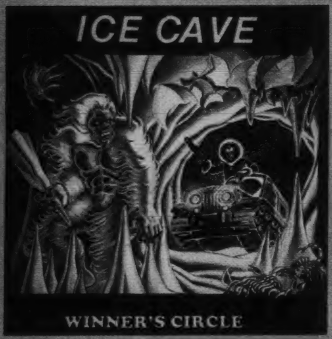
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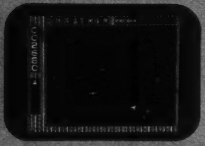
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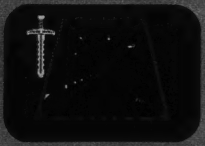
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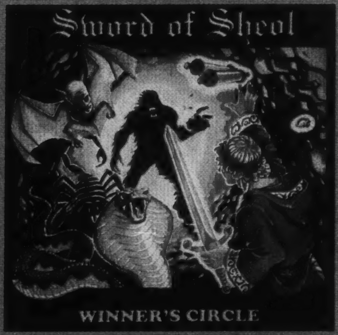
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there is a larger quiz reviewing the material. At the end of the last lesson, you are given two very thorough tests, which will help you gauge your overall progress.

Hands-on experience is indispensable in learning programming. *Step by Step* incorporates many opportunities for first-hand experience. At the end of each half lesson, you are referred back to the workbook, where the lesson material is briefly summarized and supported with a few exercises that you can work out on the computer. At the end of each lesson, the computer software frees the memory of the Apple so that you can complete the exercises.

This learning package represents a skillful blending of two very different media. None of the three principal elements of the package, the audio cassette, disk, or workbook, can stand alone, but together they make a surprisingly powerful tool for learning. The only real weakness in the package is that it is hard to find the starting points of specific lessons on the cassettes. The tapes are not labeled or indexed to show the location of the lessons (but you can make your own index by checking the numbers on the tape deck counter at the start of each lesson). Aside from this slight drawback, *Step by Step* comes highly recommended for beginning home users and for school use as well. The package, priced at $89.95, is compatible with the Apple IIe. Similar packages are available for Pet and Commodore 64 systems.

Self-Teaching Software

Now let's look at a tutorial which relies primarily on computer media—*How to Program In Applesoft Basic* by Hayden Software. This is true self-teaching software which runs on a 32K Apple II with Applesoft or Apple IIe. Two disks contain most of the text of twelve progressive lessons. When you boot the disk, a main program menu is displayed on your monitor. Options include a brief tutorial on use of the disk, six of the twelve lessons, and a quit option. Choosing a lesson brings up a table of contents that shows how the lesson is organized.

When you begin the lesson, you soon find that you may go at any speed with which you are comfortable. The text of the lessons is displayed only a few lines at a time. You may take as long as you like to absorb the material before you hit the space bar to signal that you are ready for the next block of text. If you wish to review material, you hit the ESC key and the Let's Talk option menu appears. You can quit the lesson, review the section, go to another section of the same lesson or see the lesson table of contents again.

Questions appear at various intervals during the lessons, enhancing the learning. The questions are multiple choice; if you pick a wrong answer, additional text material reviews the concepts, guiding you to a better understanding of the material. This is a feature that a book cannot easily duplicate.

A manual that accompanies the software is divided into chapters corresponding to the lessons. Each chapter very briefly outlines the material in the appropriate lesson and ends with a series of exercises that you can perform on the computer. The disks include a memory erase option which clears computer memory for the exercises. You also have the option of using a scratch disk to save your exercise programs.

School boards across the country have been hastening to buy batches of Apples, Ataris, TRS-80s and Commodores.

More Comprehensive Than Audiotape

Evaluating the package, I found that it is more comprehensive than the audiotape. The Hayden disks cover all the material in the cassette tape package and have additional or expanded material on several subjects the tapes lacked. This includes material on functions and logical operators, functions available in handling string variables, using low-resolution graphics to create animation and to make graphs. The Hayden package also tackles high-resolution graphics, a subject not covered on the audio tapes.

(In fairness, it should be pointed out that several crucial concepts are explained more clearly on the audio tapes than by the Hayden program. These topics include the creation and use of variables, how the Applesoft library functions work and how the Apple handles math. The tapes ignore hi-res graphics, but they explain scientific notation, which Hayden omits.)

One of the most valuable sections of the Hayden program is the last lesson, in which a nicely representative sample of all the programming skills hitherto developed are used in a practical calendar program which displays any month from January, 1900 to December, 1999. The lesson shows how the functions of the program are logically organized and describes in detail the construction of the routines.

How to Program in Applesoft, including the disks and the workbook, costs $49.95.

Approaching the subject matter in a way similar to the Hayden package, the *Apple II Microcomputer Workbook* and teaching disks are offered by Sterling Swift Publishing. The format is a series of lessons loaded from disk, and supported by a workbook with supplemental exercises.

The principal difference in approach is that the lessons loaded from disk require more hands-on involvement of the learner. Instead of answering multiple choice questions, you must develop your own answers. For example, when asked to write a program line to display the word HELLO on screen, you must write PRINT "HELLO" to register as correct.

RUN
SPOT
RUN

"I think I know why that educational disk only cost you $9.95."

The value of these questions becomes more apparent when you delve into more advanced concepts such as arrays, string variables, FOR-NEXT loops and library functions.

The subject matter is strictly beginner's level. High-resolution graphics are not covered, and low-resolution graphics are not examined in depth. Space on the disk, which could have been better used to explain some of the subject matter in greater depth, is used instead to discuss applications software.

One real strength of this package is the excellent workbook that accompanies it. Each lesson from the disk is extensively supported by many workbook exercises. The questions in the book are not perfunctory; they challenge as they drill concepts and test knowledge. The nature of the questions seems to indicate that the authors of the program, James L. Poirot and Donald Alan Retzlaff of North Texas State University, were thinking of the classroom when they designed this package. If the home or business learner overlooks the tone of the exercise questions, the program works fine as a self-teacher.

This instructional package comes in two flavors—disk and cassette; both list at $69 (plus $5.95 for the workbook). Other versions include tutorials for the Apple IIe, Texas Instruments, Commodore 64 and TRS-80.

Apple II Software

Name	Description	Price	Manufacturer
Apple Basic: Data File Programming	Disk supplements text of same name for quick learning	$19.95 (manual costs $12.95)	John Wiley & Sons 605 Third Ave. New York, NY 10158
Cdex Apple IIe Training Program	Fine disk-based tutorial	$59.95	Cdex Corporation 5050 Camino Real Los Altos, CA 94022
The New Step by Step	Media are mixed masterfully for maximum teaching power	$89.95	Program Design Inc. 11 Idar Ct. Greenwich, CT 06830
Apple II Microcomputer Workbook	Excellent programming tutorial	$74.95 (including workbook)	Sterling Swift Publishing P.O. Box 188 Manchaca, TX 78652
Discover Basic—Problem Solving With The Apple II Computer	Perfect for junior and senior high programming classes	$74.95 (teacher guide and disks) $5.95 (student workbook)	Sterling Swift Publishing P.O. Box 188 Manchaca, TX 78652
Know Your Apple	A first look at the Apple II	$34.95 (IIe version-$24.95)	Muse Software 347 N. Charles St. Baltimore, MD 21201
How To Program in Applesoft Basic	Excellent programming tutorial	$49.95	Hayden Software 600 Suffolk St. Lowell, MA 01853

Videotape

Name	Description	Price	Manufacturer
How to Use Your Apple II In Ten Easy Video Lessons	Comprehensive tutorial	$120, in VHS or Beta formats	Stoneware Microcomputer Products 50 Belvedere St. San Rafael, CA 94901
Computer Fundamentals and Beginning Programming	Coverage not comprehensive	$69.95, in VHS or Beta formats	Avion Video Computers 22916 Lyons Ave. Suite 2B Newhall, CA 91321

Classroom Packages

Let's digress for a moment and look at classroom learning. Teachers have special problems. School boards across the country have been hastening to buy batches of Apples, Ataris, TRS-80s and Commodores for junior high and high school computer literacy programs often without providing texts and teaching materials. Finding instructional materials that will work in the classroom is a difficult task for teachers. The materials for children, as for adults, have to suit varied learning styles.

Well, here are some answers. First, any of the software packages discussed will adapt well for school use on the junior high and high school levels. There are also, in increasing numbers, teaching packages specifically designed for classroom use.

A representative example of a classroom package is *Discover Basic—Problem Solving With the Apple II Computer*, published by Sterling Swift and created by Rick Thomas, a programming teacher at Junction City High School, Junction City, OR. Like *How to Program* from Hayden and the *Microcomputer Workbook*, Thomas's program blends materials loaded from disk with a written text. The difference is that the written word has a decided advantage over the electronic medium. The factual material is to be communicated by the teacher and through the workbook, not through the computer. The computer serves only as a medium for completing assigned exercises.

The role of the disk material is to provide a variety of demonstration programs that a student or small group of students can load, run and—most important—modify as the workbook or instructor suggests. In the teacher's guide to the learning package, Thomas calls it a learning by discovery package. The student, armed with the appropriate concepts, is given a chance to experiment, to observe the results and to write his observations. Eventually the student is able to predict the results to be obtained by writing specific program statements. At that point, the student is programming.

The material appears to be just right for an intensive semester at the high school level or for a year's work for junior high children. It covers screen output commands, creating and using variables, counting, error checks, IF-THEN conditionals, loops, character strings, library functions, arrays, and low-resolution graphics. Combing through the listings of the demonstration programs, modifying them and writing new programs, the student should get a thorough grounding in the basics of Basic.

The Teacher's Guide with demonstrations and solutions disk lists for $74.95. The student workbook costs $5.95.

Writing Software

The goal of learning to program is to acquire the ability to write software that solves a specific problem or performs given tasks. Having the basic skills, a beginning programmer may still find it difficult to start from scratch in creating a sophisticated applications program. Though I found many tutorials in print and mixed media on programming basics, I found few books focusing on narrower programming tasks.

One self-teaching guide, combining a printed manual and a disk is *Apple Basic: Data File Programming* by LeRoy Finkel and Jerald R. Brown, published by John Wiley & Sons. As the title implies, the book focuses on creating files of numerical and text data by writing programs to enter that information, organize it and then access it as necessary. The course reviews the fundamentals of Basic, which you should be able to assimilate using one of the tutorials. It covers data entry and error checking, the creation of sequential files and programs, and the creation and use of random access files.

The authors are well aware of the value of hands-on instruction. Most of the book is programming exercises, in written form and, with the Apple II, designed to reinforce concepts and get the learner thinking.

On examining this course, we discover that we have come almost full circle, back to dependence on the written word. The subject matter is presented primarily through the written manual. In fact, the book can fulfill its teaching purpose perfectly well without the supplementary disk which contains no instructional material. The disk simply loads program examples from the text as a timesaving alternative to keying them manually from the book. It runs on a 32K Apple II with Applesoft.

Summary

These are only a few of the teaching packages available to you as you approach your Apple II for the first time. Similar tutorials are available in ever-increasing numbers for the other major microcomputer systems.

How you choose an instructional package for yourself should depend on three basic points: First, what you want your computer to do for you? If you want to run only preprogrammed applications software and games, leave programming courses alone for now and choose instead a course that teaches you the basics of computer use.

Second, what medium do you feel most comfortable with? Whether you believe you can learn best from a book or whether you want to learn through video instruction or audio tapes, try to skim through or preview the learning package before you buy.

Finally, does the learning package give you a chance to get your hands on the computer and work with it? No amount of text, written exercises, pictures or sounds can replace the experience of actually testing your programming knowledge on the computer.

Few learning experiences are as gratifying as writing a computer program and running it, seeing that it works error free. That is the moment you can say for the first time, "I'm a programmer." ☐

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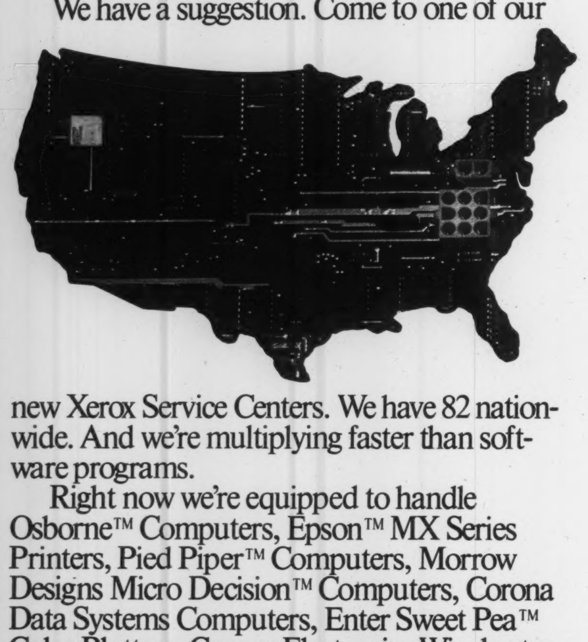

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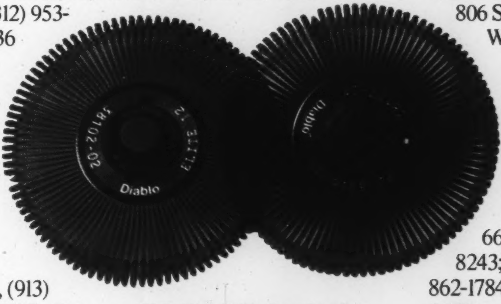

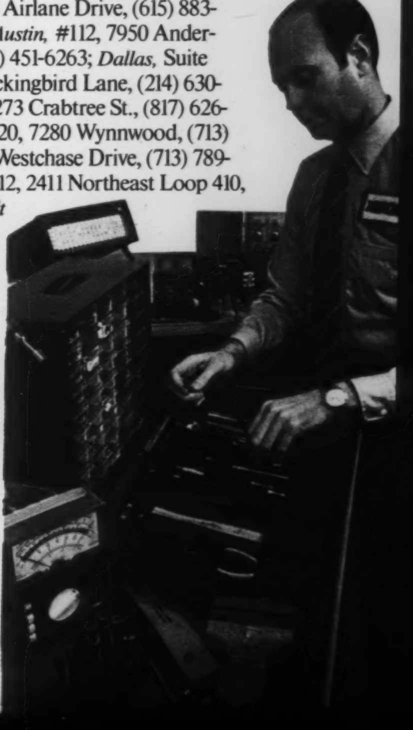

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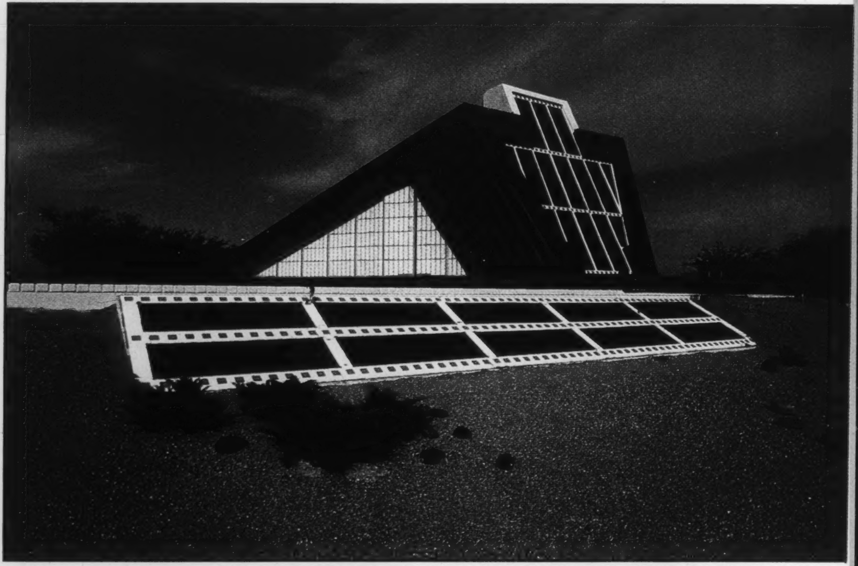
Catrien Ross Laetz

Most personal computer enthusiasts dream of the house of the future. If you are one of them, compare this description of a full scale, built-from-scratch, futurist's dream house with the following review of the HomeBrain in which Glenn Hart puts very similar features and capabilities within reach of most micro owners.



Rising out of the Arizona desert, the copper trimmed structure of the House of the Future houses a unique system for complete computer control of the home.

As Don Sheppard punches his special code into the electronic keypad at the entryway, a monotone computer voice says, "Welcome-home-Don-come-right-in." The front door then glides open.

Once inside, Don can rely on the computer to lock the door behind him, turn the lights on, and adjust the room temperature to the most comfortable level. In the kitchen he can use the computer terminal to check the day's messages, enter tomorrow's appointments and retrieve a favorite recipe. After dinner, if he feels like relaxing, he can put his feet up in the entertainment room and play a leisurely game of computer chess. He can also catch up on computer educational programs on the large color TV. When he finally goes to bed he can rest easy, because the computer will function as a security system that will alert his sleeping form to intruders, break-ins, or fire.

Sheppard is not really the resident of this futuristic home. He is, however, its computer program manager—the man

---

Catrien Ross Laetz, 2030 S. Dromedary Dr., Tempe, AZ 85282.

Triangle motifs and courageous color schemes are echoed throughout the bright, light interior.

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in charge of this exciting Arizona project involving complete computer control of the home. The project—the only one of its kind—is called, appropriately enough, the House of the Future.

Opened in 1980, the House of the Future was designed to be a showcase for state-of-the-art electronic innovations. Since then it has served as a "living laboratory" for the latest in computer technology, manufacturing techniques and energy management methods. Today, it continues as a test bed for the newest ideas in computer design and application for tomorrow's world.

The structure itself is a 3100 square foot, copper-trimmed prism rising out of the Arizona desert. Computer-controlled solar collectors on the south face of the house provide 75% of the heating and 95% of the domestic hot water needs. Large translucent fiberglass panels (used instead of windows) are also regulated by microprocessors.

The only permanent resident of the House of the Future is the computer.

Inside, the house is as startling as it is outside. Sharply angled rooms display a riot of primary colors. A triangle motif, based on an "Indian Jewelery" theme, is echoed throughout, in colors of pink, orange, green and turquoise. A lush atrium and fountains surround the conversation pit, where a heatilator fireplace reaches up to the 32-foot ceilings.

For the moment, the only permanent resident of the House of the Future is the computer. That monotone voice which greets visitors belongs to a unique, Motorola-designed five-unit computer network which serves as the nerve center of the building. Based on Motorola's MC6800 microprocessor, the computer does much more than greet visitors and open doors, however. The microcomputer system is actually a sophisticated home manager which monitors and controls everything from outside temperature to what's cooking in the oven.

As the "living" organism within this "living laboratory," the computer responds to internal and external stimuli and makes decisions and adjustments accordingly. It measures temperature and decides whether or not to open or close cooling windows, for example. It also determines the humidity level of the air (in order to turn on a special evaporative cooler). And it maintains different temperatures at different times of the day in different parts of the house, thereby meeting heating and cooling needs in the most efficient manner.

As far as technological know-how is concerned, the Home Management System in the house is considered a pioneer in the field of computer control of the home. Although it was designed two years ago, it uses a distributed processing network, a concept which is at the forefront of computerized industrial application today. Such a network minimizes response time from input to action and preserves system integrity under failure conditions. The system also uses such things as table managers to maintain and act on tables of data relating to energy and security control throughout the home.

The main problems confronting the average homeowner desirous of controlling his home by computer are those of wiring the house and converting control signals—actually finding a way for the computer to communicate with home appliances. In the House of the Future these problems have been resolved successfully. Wiring was taken care of because the computer was installed as the house was being built. Signal communication is achieved through digital input/output boards which sense switch closures of door keypads, wall switches, smoke detectors and motion detectors. In addition, an analog board handles analog input flow, temperature and humidity sensors, and watt transducers.

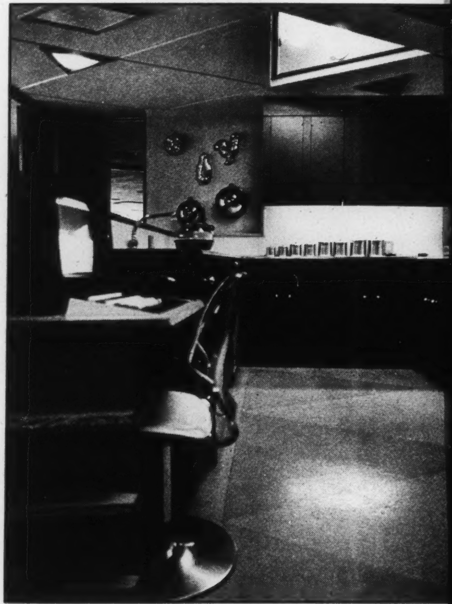
The display/keyboard card was custom designed. It provides alphanumeric and graphic displays in eight colors and is based on the MC6874 video display generator and the MC1372 modulator. These devices are ideal for homeowner applications such as TV games and personal computers.

At the primary microcomputer node, located in the entertainment room, there is a screen printer and a dual floppy drive (Motorola EXORdisk). The entertainment room node also has a readout display, as does the master bedroom node and the kitchen node. The fourth microcomputer node is in the laundry room; the fifth is just outside the entertainment room.

All software for the House of the Future computer is written in Motorola's high-level language, MPL.

All software for the House of the Future computer is written in Motorola's high-level language, MPL. It permits structured programming and allows software to be developed in a very short period of time. The software consists of an operating system package and an applications package which reside in each of the five microprocessor nodes.

The Home Management System of the House of the Future controls five main areas—information, security, environment, electrical load switching, and energy management.



A computer display terminal is conveniently located in the kitchen of the House of the Future.

Information

As an information manager the computer can be used for the storage and retrieval of text and graphic information. Everything from addresses, recipes, vital records, and upcoming events can be stored under a file name on a floppy disk. In addition, there is a special type of information which is retrieved by date rather than name. This "desk calendar" mode functions as a convenient family activity planner.

Security

The House of the Future has no traditional locks. The security measures used are entirely dependent on the innovative computer system. At the front

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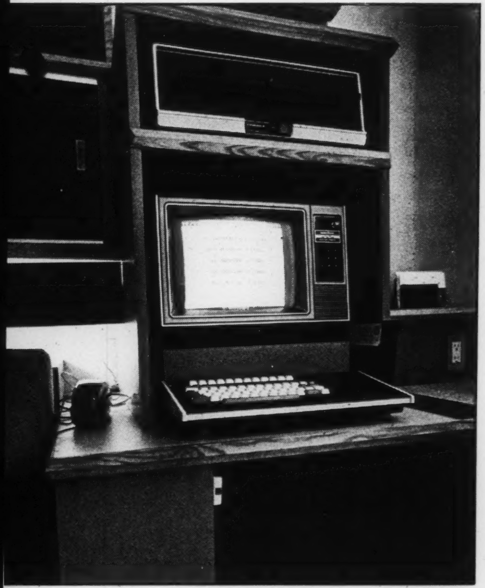
door, the computer activates a solenoid which glides open the panel when the correct personal code is entered into the keypad. The security function can also cycle lights throughout the rooms when residents are away from home. In the case of fire, the computer sets off smoke detectors and calls out Fire!, Fire! When an intruder is sensed, alarms are sounded, lights come on, and the computer pinpoints exactly where the intrusion has occurred. Closed circuit TV cameras continually survey the front entrance as well as pool and patio areas.

Environment

So that the computer can properly control the environment, the House of the Future is divided into three zones, each of which is treated as if it had its own thermostat. The homeowner thus uses heating and cooling only where it is desired. For example, at night, the bedrooms only can be heated or cooled, without having to heat up or cool down the entire house.

The computer system senses the temperatures and then reacts by choosing the heating or cooling equipment that will respond to climactic conditions in the most energy-efficient manner. If the central part of the house is too warm, the computer will first check the outside temperature to determine whether doors and window panels should be opened. If so, the computer opens appropriate panels and doors to let cooler air inside. If the outside air is too warm, the system might choose to turn on the evaporative cooler. But first of all it determines the humidity level in the air. If the air is too humid, the computer turns on the air conditioning system.

The master bedroom was designed with a built-in video display terminal as part of the furnishings.



The primary microcomputer node is this built-in node and display terminal located in the entertainment room.

Electrical Load Switching

The function of electrical load switching is to monitor wall switches and activate wall outlets and appliances under software control. Because a wall switch can perform any function defined by the homeowner, it could conceivably control any or even several functions based on considerations such as time of day. Due to this electrical load switching function, the Home Management System controls and monitors all electrical functions in the home.

Energy Management

In the House of the Future, there is no need to worry about lights being left on in unused rooms. Installed motion detectors are used to turn lights on and off whenever someone enters or leaves a room. Another energy saving method is use of time of day control. This allows the swimming pool filter and pump to be automatically cycled on and off for energy conservation.

The system also monitors energy usage for the entire house. This means that the data provided can be used to make decisions regarding optimum use of appliances. The homeowner can monitor consumption rates in terms of dollars and cents and thus can effectively change total energy usage to conserve.

Under the Display Process of the Home Management System, there are five basic activities for the homeowner to choose from. They are: Information Actions, Calendar Actions, Monitor Actions, Program Actions, and Special Actions.

Each of these actions lets the homeowner enter, store, delete, and review pertinent data. By selecting, say, Information Actions, the homeowner can, by means of the elementary screen editor, create text and graphics on the screen. This information can be stored on the disk under an eight-character file name, ready for future retrieval or modification.

There is no need to worry about lights being left on in unused rooms.

In Calendar Actions the Display Process prompts for a date and message to be entered. Later, when information for a specific date is requested, the text of the appropriate message is displayed.

House of the Future, continued...

Monitor Actions displays the status of all major system processes, including security, energy management, environmental and load managers. Each of these processes returns data pertaining to load statuses, energy consumption, and room temperatures. This important information is then formatted by the Display Process which displays it on the screen for analysis by the homeowner.

Program Actions let the homeowner add, delete, or examine entries from the control tables of processes. Because a critical control parameter might be changed, the Display Process incorporates a level of access privilege using passwords for protection.

Special Actions is simply a means to change passwords, arm, disarm, or clear security alarms and to back up disks.

At a time when the questions of computer-controlled homes is only just being confronted, the House of the Future offers a showcase of exciting possibilities. As a successful experiment in innovative applications of off-the-shelf hardware and software, this unique structure points the way for manufacturer and consumer alike.

The House of the Future shows that computer control of the home can be, and indeed has been, achieved. And if its Home Management System is anything to go by, then the average homeowner can look forward to increasingly widespread use of computers to monitor and control every conceivable house function.

As a herald of tomorrow's world, Arizona's House of the Future is an indication that the computer-controlled American home is just around the corner—available for anyone and everyone who has ever dreamed of its creativity and convenience. ☐

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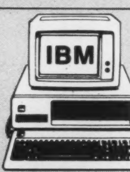

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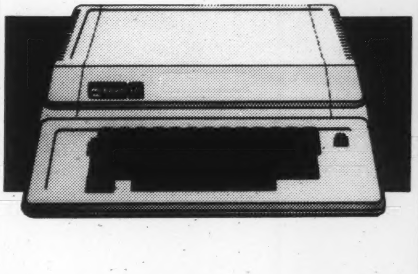

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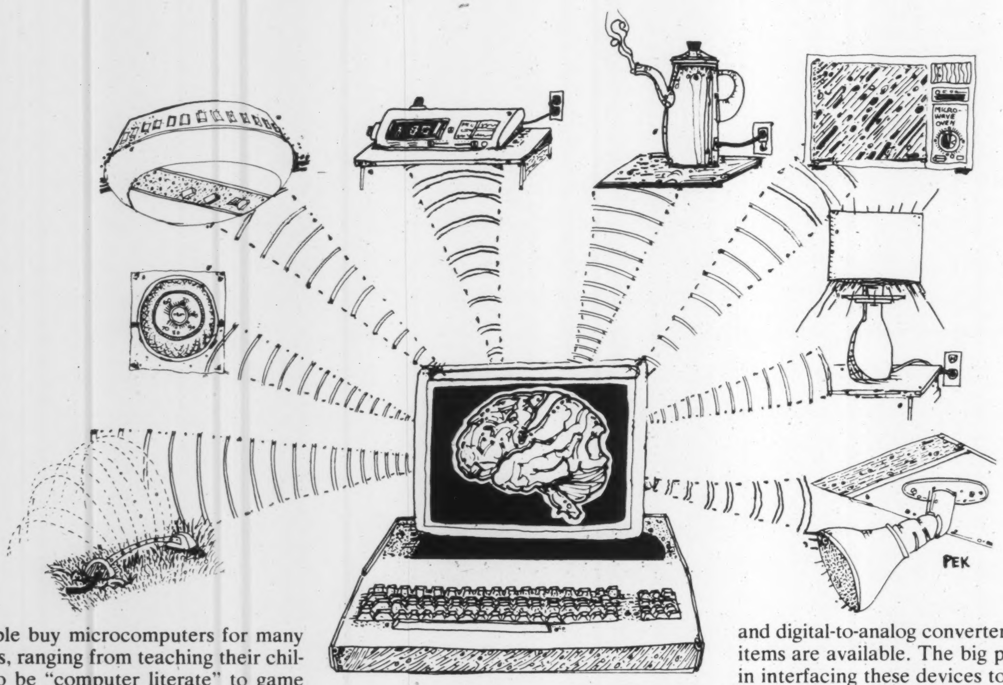
The Hypertek HomeBrain



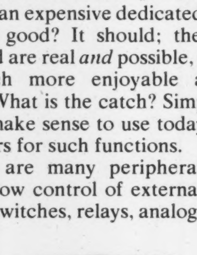
Glenn A. Hart

People buy microcomputers for many reasons, ranging from teaching their children to be "computer literate" to game playing to word processing and accounting. One use which many potential and current owners assume is possible is "environmental control," which can be defined as switching or modulation of devices which affect such aspects of the user's surroundings as temperature, humidity, and lighting. The benefits of using the intelligence of a computer for such control include the fact that you can allow different actions to occur based on preprogrammed circumstances, you can accommodate complex situations, you can provide for randomness to give the appearance of human presence, and you can realize significant energy cost savings without a negative effect on comfort or safety.

Widespread publicity has been given to "the home of the future" which includes such capabilities. Given the proliferation of "intelligent" appliances and other devices with imbedded microprocessors, today's microcomputerist can envision control systems, security protection, and other home systems which are vastly more sophisticated and flexible, while being less costly, than expensive dedicated systems.

Sound good? It should; the benefits described are real *and* possible, can make life much more enjoyable and save money. What is the catch? Simply that it doesn't make sense to use today's microcomputers for such functions.

There are many peripheral devices which allow control of external devices. Various switches, relays, analog-to-digital and digital-to-analog converters and other items are available. The big problems lie in interfacing these devices to the microcomputer and creating the software necessary to make them do anything useful.



While some of the mechanisms use standard serial or parallel ports, most do not. Even if they do, adding input/output ports, correctly wiring the cables and controlling the devices in software is far from trivial and depends heavily on the specific computer being used. If nonstandard I/O is required, the problems quickly escalate beyond the skills of even a reasonably experienced computerist.

Even if we assume that all the necessary peripheral devices have somehow been interfaced correctly to the computer, the software problem looms large. Custom devices require custom software. Even if *this* has been done, the biggest problem of all surfaces: very few current computers can do more than one thing at a time.

This means that the computer must be *dedicated* to the control function if anything useful is to be accomplished, rendering it totally unavailable for any other application. Few users will be willing to

---

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relinquish their cherished and costly computers or to buy another one just for home control. Even multi-tasking computers (ones that can execute more than one program at a time) don't fully solve the problem, since even they must be left running continuously.

These difficulties render most of the available control devices essentially useless except in special applications. While there are certainly many impressive applications of computers in device and environmental control, these are simply beyond the capabilities of most users.

The Hypertek HomeBrain

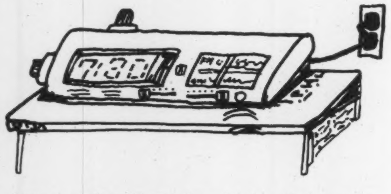
A small company called Hypertek has developed a new product that solves these problems in a unique and clever manner. The HomeBrain is a microcomputer dedicated to home control; it is tremendously flexible and powerful. The fascinating part is that you use your current microcomputer to program the microcomputer in the HomeBrain. All the capabilities of your main system, including disk drives, high level languages, and fancy video terminal, are used, but once the HomeBrain has been programmed you don't need to touch it at all unless you want to change the programming. Your main computer is totally uninvolved and free to use for whatever you want.

The heart of the HomeBrain is a 6502 microprocessor, the same one used in the Apple II, Atari, Commodore and other popular computers. Programs are stored in 2K of RAM, while 6K of ROM stores the HomeBrain control language discussed below. Thirty-two buffered digital inputs for a variety of devices are available, as are eight SPDT 3-amp, 125-volt relays for output devices. The number of inputs or relays can be doubled if desired.

You use your current microcomputer to program the microcomputer in the HomeBrain.

A standard RS-232 serial port is used for communication with the main computer. Standard communication rates are 300 and 1200 baud. In a sense, the AC power cord is also an output, since the HomeBrain can also control 256 BSR or Leviton wireless home control modules by sending radio frequency signals through the AC wiring of the house. The HomeBrain includes provisions for interconnecting other HomeBrains or future intelligent peripherals from Hypertek over a simple two-wire twisted pair network. Since Hypertek also manufactures HomeBrain-like devices for commercial buildings and laboratory control, it is likely they will come out with new devices in the future, so the networking provision helps assure that the HomeBrain will remain state-of-the-art.

The HomeBrain is powered by a special uninterruptible power supply which uses a continuously charged battery system and can also handle brownouts down to 95 volts. Should normal AC power fail, the HomeBrain continues to operate normally for three hours controlling battery operated devices (but obviously not BSR modules, which are dependent on AC power). After this, the HomeBrain goes into a "sleep" mode which retains programming and other stored information for about a month.



The 32 inputs are designed for switches, relays, or open collector or low voltage devices. This includes thermostats, motion detectors (ultrasonic, infrared, microwave or whatever), smoke alarms, moisture sensors, light detectors, and a multitude of other devices. While wires from most input devices are connected directly to the HomeBrain inputs, it is possible to use radio telemetry devices to send remote data to the HomeBrain without wires. The relays of HomeBrain are normally used to turn on such devices as sirens and emergency lighting. Optionally available is analog input, which allows input of temperatures and other varying measurements rather than simple on/off status.

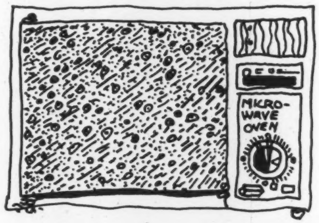
Perhaps the biggest strength of the HomeBrain is the high level command language which is stored in ROM.

HomeBrain Language

Perhaps the biggest strength of the HomeBrain is the high level command language which is stored in ROM. To use it, a program is run on your main computer which communicates with the HomeBrain over the serial link. This program must be customized for the main computer to initialize the serial channel. Hypertek has versions for many different computers, ranging from the Commodore Vic 20 to a variety of CP/M systems. My own system uses somewhat idiosyncratic communications chips, but Hypertek was able to write a custom routine which worked perfectly almost immediately.

The HomeBrain language consists of commands which instruct the unit to perform a wide variety of functions. Table I lists the available instructions grouped by function with an explanation of the purpose of the commands. The language is based on the concept of a *stack*, which is a kind of buffer in which the command last entered is the first available. It can be viewed as analogous to a stack of dishes, in which you would put a new dish on top of the stack and also get the next dish from the top of the pile. Users of Hewlett-Packard calculators or computer languages like Forth will feel comfortable with HomeBrain immediately, but beginners may have some problems. Overall documentation is rather technical and could be improved for the novice.

Fortunately, the software that is operated on the main computer makes programming the HomeBrain quite a bit easier than it would be if all the instructions had to be entered one at a time. Using menus to guide the user, several of the most important functions are simplified to an interactive dialog so the user doesn't have to know the exact commands necessary to perform a function. The current software is reasonably good in this regard, but Hypertek is now upgrading it to include simplified input of even more functions.



The major programming effort consists of defining networks of commands. The

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HomeBrain scans these networks four to ten times every second (depending on the complexity of the programming), and checks for inputs and other events. It then carries out whatever steps are necessary to implement your home control strategy.

Table 1 hints at the tremendous flexibility available. It is not exaggerating to say that practically *anything* is possible with the HomeBrain. The HomeBrain can do so many things that it clearly isn't possible to describe all of them in an evaluation like this, but perhaps a few examples will give you some idea of the possibilities.

The HomeBrain At Work

Security systems can use a wide variety of sensors. Doors and windows can be wired with magnetic switches (which can be imbedded in the frames so they are not visible to you or to a potential intruder). Microwave, infrared, or ultrasonic detectors can be used to sense motion, or audio discriminator devices can be used to sense the noise of an attempted break in. Some of these devices are available with radio frequency output with a receiver that is placed at the HomeBrain end and totally eliminates wiring.

> ***My HomeBrain is programmed to allow me to deactivate my fire sequence within 30 seconds, in case the detectors have been set off by broiling lamb chops.***

Outputs can use several types of sirens or lights which can be made to turn on continuously or flash either inside or outside the house. If the appropriate equipment is connected to the HomeBrain, telephone contact can be made with the local police or fire department, ordinances permitting, or with commercial security services. Actuation of the system can be with simple switches with the normal exit and entry delays programmable for your needs, or a more clever system can be constructed. For example, the system could be disarmed by closing a door three times within 20 seconds.

The advantages of such a security system include total adaptability and the ability to structure multiple tiers of security. To avoid annoying and embarrassing false alarms, one could activate motion detectors inside the house only *after* a window or door switch was opened.

Handling a fire can be equally sophisticated. I use smoke detectors with RF outputs to avoid wiring. When actuated, these detectors emit a loud siren. My HomeBrain is programmed to allow me to deactivate my fire sequence within 30 seconds, in case the detectors have been set off by broiling lamb chops. If it is a real emergency, the HomeBrain activates sirens outside the house to alert neighbors, flashes outside lights and turns on

Table 1. HomeBrain Language Commands.

1. *Network Commands* - Networks are short control programs consisting of a series of commands. The HomeBrain can store 32 such networks, each of sufficient length for even complex control schemes.

ENANET - Enable network.
DISNET - Disable network.
SKPNET - Skip balance of network (conditional).
CLRNET - Clear network from memory.

2. *Input Commands* - Used to check the internal registers of the HomeBrain so logical decisions can be made.

INPUT- PUSH the current status of a register onto the stack.
TRUP - Checks the register for a transition from off to on since the previous scan.
TRDN - Checks for the transition from on to off.
TRCH - Checks for either change (on to off *or* off to on).

3. *Output Commands* - Used to update the status of registers.

OUTPUT - Turns a register on or off depending on stack.
OUTCON - Conditionally turns register on or off, used with the TRCH command.
OUTCC - Sends commands to BSR modules. Can control on/off status, dimming, etc. for 256 BSR devices.
ONREG - Turn on a register.
OFFREG - Turn off a register.

4. *Logical Commands and Stack Manipulation* - Used to manipulate the stack and link various HomeBrain registers together.

AND - Logical ANDs two previous stack entries and PUSHes the result onto the stack.
OR - Logical OR.
XOR - Logical EXCLUSIVE OR.
NOT - Inverts the last entry on the stack.
ON - PUSHes an on onto the stack.
OFF - PUSHes an off onto the stack.
PUSH - PUSHes the stack, creating a duplicate of the last entry.
POP - POPs the stack to recover a previous entry.

5. *Counter Commands* - The HomeBrain maintains sixteen 16-bit counters. A counter is linked with an output register; when the counter is set, the register is turned off; when the counter decrements to zero the register is turned on.

DEFCNT - Define the counter by linking the counter with an output register.
SETCNT - Set a counter to a new value.
DECCNT - Decrement (reduce by one) the counter.
REACNT - Read the value currently in the counter.

6. *Timer Commands* - Sixteen 16-bit timers are available for various purposes. The timer is on when a reference input register is on. When the timer decrements to zero an output register is turned on.

DEFTMR - Associate a timer with an input and output register.
SETTMR - Set a timer to a new time count.
ENATMR - Enable a timer.
DISTMR- Disable a timer.
REATMR - Read the time remaining, definition and status of a timer.

7. *Alarm Clock Commands* - Sixteen internal alarm clocks are maintained. A seven-day enabling schedule controls the days the alarm clock is available. If the alarm is enabled on a given day, an output register is turned on when the time is reached.

DEFALM - Define an alarm clock, including its output register and day of week enable schedule.
SETALM - Set an alarm clock to a specific time.
ENAALM - Enable an alarm clock.
DISALM - Disable an alarm clock.
REAALM - Read the time setting, output register, status and day of week schedule for an alarm clock.

Table 1, continued

8. *Calendar Commands* - Turns a register on at midnight of any specified date.

DEFCAL - Define link between a given calendar event and an output register.
SETCAL - Set the date for a calendar event.
REACAL - Read the date and output register for a calendar event.

9. *Data Monitor Commands* - Sixteen data monitors accumulate the total time an internal register is on. This can be used for power consumption and cost calculations.

DEFMON - Begin monitoring any specified HomeBrain register.
REAMON - Read time and output register for a data monitor.

10. *Schedule Commands* - Sixteen schedules allow controlling output registers with 15 minute precision over a weekly schedule. Immediate commands can override the schedule without affecting future operation.

DEFSCD - Define a schedule by indicating the output register to be linked with a selected schedule on a given set of days of the week.

ENASCD - Enable a schedule.
DISSCD - Disable a schedule.
REASCD - Read a schedule, its definition and the associated output register.

11. *Real-Time Clock Control* - The HomeBrain has a real-time clock which maintains the time, date, year and day of week.

SETTIM - Set the time.
REATIM - Read the time.
SETDAT - Set the date.
READAT - Read the date.

12. *Carrier Current Table Control* - A 32-byte table, which contains address codes for specific BSR modules is maintained. Each entry in the table is linked directly to a HomeBrain internal register. A change in that register automatically actuates the associated BSR device.

DEFCC - Define entries in the carrier current table.
REACC - Read the entire carrier current table.

13. *Power Failure Table Control* - The HomeBrain maintains an internal table which controls what happens in the event of a power failure and also what takes place when power is restored.

DEFPF - Sets an entry in the power failure table, which can indicate that a register should be turned off if power fails or be left alone.
REAREG - Read a register's status, including its power failure table entry.

14. *Password Control* - The HomeBrain can recognize a 4-byte password to allow restricting access to the programming of the unit to authorized users.

ENAPAS - Enable communications by providing the authorized password.
DISPAS - Disable communications until the password is provided.
NEWPAS - Assign a new password.

15. *Time Jog Control* - The HomeBrain can randomly vary the actuation of all alarm clocks and schedules so events are not too predictable during a long absence.

ENAJOG - Enable the scheduling offsets.
DISJOG - Disable the scheduling offsets.

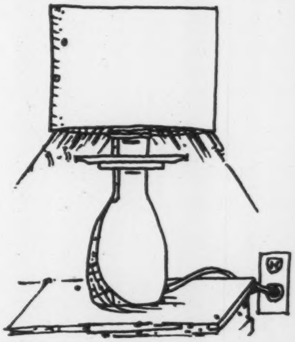
16. *Sequencer Commands* - The HomeBrain can simulate stepping switches using internal registers as the individual contacts.

DEFSEQ - Define a sequencer by specifying the starting register and the length of the sequence.
INCSEQ - Step or increment a sequencer.
CLRSEQ - Reset or clear a sequencer back to its starting register.
REASEQ - Read the status and definition of a sequencer.

battery operated emergency lighting which indicates the correct exit path from the house even in confusing, smoke filled circumstances. My house doesn't have forced air heating and air conditioning, but if it did the HomeBrain could have been programmed to turn off air motion if a fire developed. Since smoke circulation through a ventilation system is a major problem in home and commercial fires, this ability could be of great importance.

Controlling interior lighting can be much more powerful than with the BSR modules alone (by the way, normal BSR command consoles can still be used for manual control of BSR devices). Hitting a single switch once turns on the lights in an area. Hitting it again once or twice brings the lighting to pre-programmed dimming levels appropriate for different activities. The BSR modules can also be used for timed activities such as brewing coffee in the morning.

The timing abilities built into the HomeBrain can be used for other control purposes as well. Programming a set-back thermostat (when the temperature varies throughout the day) is easy. Depending on how your home heating system is set up, the HomeBrain can easily establish different heating programs for different areas of the house. Even in a one-zone system, a simulation of multi-zone operation can be programmed so that the thermostat in one area is in control during specified hours. Central air conditioning can be similarly controlled, or window units can be manipulated with BSR appliance modules.



The motion detectors used for security can also be used in conjunction with timers and other mechanisms for multiple purposes. In my house, the interior microwave sensors do nothing in the daytime unless security is activated. In the evening, a person entering the room turns on the lights. They stay on for ten minutes unless there is more motion in the room, in which case they continue on. Activating the security system programs the HomeBrain to consider motion an intrusion if certain other events have also taken place.

I also use microwave detectors on my doors to act as doorbells. A chime is rung

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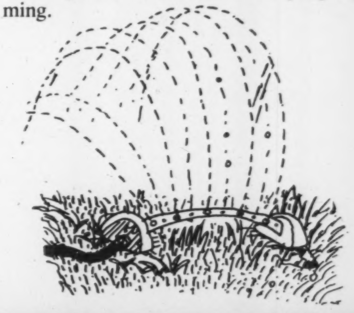
whenever anyone approaches a door unless I have switched this function off to avoid constant ringing when my children are playing in the area. The "doorbell" also flashes lights in my third floor office so I don't have to worry about hearing the chime if the door is closed (this also saved me the trouble of wiring anything to the third floor).

Other types of sensors expand the possibilities. Light sensors can automatically change the programming based on whether it is day or night. Moisture sensors can be used either to give an alarm if water enters a basement or to control automatic sprinkler systems. Unlike the simple timers that come with sprinkler systems, the HomeBrain can be programmed to turn on the water if the moisture drops below a certain level, unless it is between 11:00 a.m. and 3:00 p.m. when the sun is overhead and unless the program has been deactivated with a switch (we wouldn't want it to sprinkle our guests on Saturday afternoon). Controlling a greenhouse would be just as easy.

By now, you should be getting some idea of how truly powerful the HomeBrain is, and the tremendous control over your environment it can produce. My personal HomeBrain has converted my old house into an absolutely state-of-the-art "Home of the Future" with a minimum of fuss, and I can constantly change the operation of the system to reflect new circumstances, changing needs, or the appearance of new technology. My HomeBrain has been in constant use for six months with no problems whatever, and Hypertek has been very cooperative and helpful in advising me on installation and programming.

> ***My personal HomeBrain has converted my old house into an absolutely state-of-the-art "Home of the Future."***



Cost

The cost of such a set up has to be considered in several contexts. The $999 cost of the HomeBrain itself is only the beginning. Depending on the situation and how fancy you want to get, it is easy to spend twice this amount or more for the various motion sensors, smoke detectors, BSR modules and other devices which can be connected. If you already have a home computer, that cost is taken care of; otherwise, an inexpensive Vic, Atari, TI or the like will do just fine (and do many other useful things for you as well). Installation can be a bit of a chore and expense, although it is not at all difficult to do this yourself.

This is clearly quite a bit of money. However, a fully configured HomeBrain system still costs much less than most professional security systems and obviously is very much more flexible and powerful.

All in all, the HomeBrain is one of the most exciting devices I have come across in quite a while. We computer types can get a bit jaded with new technology, but the HomeBrain has never ceased to please me and amaze my friends.

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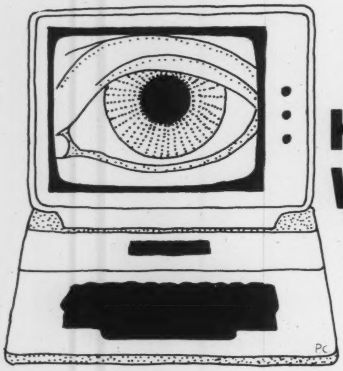


Home Security With the Eye

Otto Moyen-van Slimming

Moving into our own home after living in government housing for several years, one of our first concerns was a home security system. Since I had purchased a BSR remote controller and some lamp modules from Radio Shack, I needed a system that would interface with that system. After considering several commercial systems and thinking about designing my own, I decided to purchase the Eye, manufactured by Lehigh Valley Computer Corporation.

Since it is a new product, and I live in a remote location, I had only the company's brochures to go by. Their system has several features that prompted my decision. The Eye controller board plugs into one of the I/O slots of my Apple computer, providing a real-time clock capability apart from the security system. The Eye also provides the capability to control remotely up to 256 different strings of lights and appliances via the BSR modules. I decided to try it.

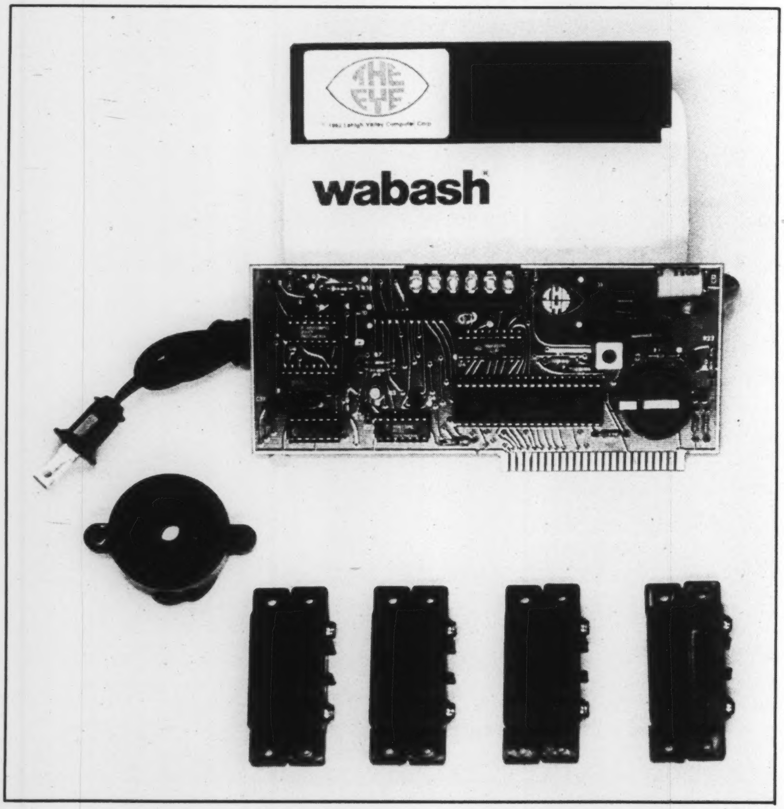
The package, which arrived by UPS in just a few days, contained the main controller card, four magnetic switches, a piezo-electric alarm, a 5¼" disk and a user manual.

The controller uses a standard 50-pin edge card with six-foot power cord and a back-up battery. The board contains an OKI5832 Clock Generator chip, five other ICs, and a six-post terminal connector to tie in the remote sensing devices. The alarm looked like a toy, so I tossed it aside. The magnetic switches, the kind that are readily available at electronic stores, consist of two parts—a magnet and the actual switch, closed when the magnet is near and open when the magnet is removed. This makes it a handy device to detect an open door or window.

I inserted the disk into the drive, hit the power-on switch and the Eye came up with a menu. I hit RESET and quickly made several back-up copies of the software (completely unlocked and mostly in Basic).

User Manual

The manual consists of a bound volume of 30 typeset pages. The manual briefly explains the system and provides several examples of system implementations ranging from a basic system to a deluxe version with all the bells and whistles. It also covers the operation of the real-time clock and the remote BSR controller. The illustrations



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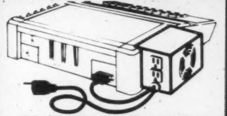

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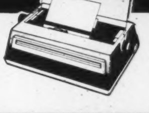

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are hand drawn, but adequate; there are no photographs. I was satisfied with the quality of the documentation.

Following the installation instructions, I installed the controller card in slot #4, connected the piezo-electric alarm, plugged the connector into an AC outlet and booted the system.

System Operation

The Eye provides the capability to monitor three separate detection circuits via three channels: X, Y, and Z, so the house or building being protected can be divided into three zones. For example, channel X could monitor the doors, channel Y the windows and channel Z pressure sensitive mat switches, providing both peripheral and interior security (see Figure 1).

Each channel can monitor only switches of the same type, i.e., normally open (N/O) or normally closed (N/C). All N/C switches must be wired in series while all N/O switches must be wired in parallel, forming a loop for each channel. This ensures that a single switch will trigger the alarm function of the Eye. The system allows you to specify which channels are to be monitored and the type of switches in the loop of each channel.

The system operates in two modes—foreground and background. In the foreground mode, the Apple is totally dedicated to the Eye. The Applesoft Basic program, called Eye, runs continuously, monitoring the channels that are active, turning lights and appliances on and off, and even turning itself automatically on or off at specified times. The current time and system status is displayed on the screen.

The Eye provides an alarm or controls lights and appliances only when it is active. You can activate the system manually or the Eye will do so automatically. In the manual mode, the system becomes active five minutes after you command it to activate, thereby giving you five minutes to get out of the house or the building before the system is armed.

The Eye also can be programmed to activate or de-activate itself at a specific time (only two ON and two OFF time in a 24-hour period). You would use this mode if you wanted the system to be active during the same period each day. For example, the last employee of a store leaves at 9:00 p.m., so the Eye is programmed to become active at 21:05 (all times are based on a 24-hour clock) and to turn itself off at 7:55, just before the owner arrives to open the store.

Note that selecting the automatic mode from the menu when the Eye is programmed to be active will arm the system immediately, without the five-minute delay provided by the manual mode. Thus, if the system is programmed to activate at 6:00 p.m. and de-activate at 6:00 a.m., selecting the automatic mode at 10:00 p.m. will prevent you from leaving by an alarmed door without setting off the alarm.

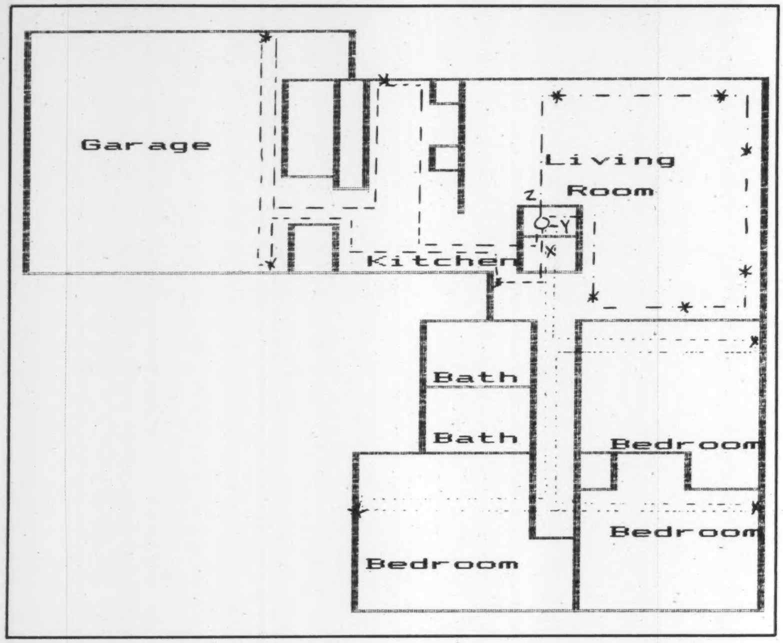


Figure 1.

The system allows you to specify the delay time between the detection of an intrusion and the time it actually gives the alarm. This time is variable, giving you any amount of time to enter while the Eye is active and de-activate the system before it turns on the siren and calls the police.

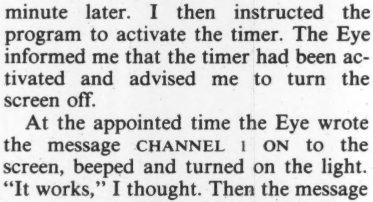
The system can be interrupted by a CTRL-C. This puts the Eye in the background mode, provided that the system was active when background was selected. In this mode the system does not read the real-time clock, so its timed functions do not operate, except for the entry delay. If any channel signals a change in state, indicating an alarm condition, however, the Eye will initiate an interrupt on the Interrupt ReQuest (IRQ) line to the Apple CPU. The programmed alarm functions (e.g., sounding the siren) are then executed.

If you are running a program while the Eye is active in background and don't want to be interrupted, you should set the Interrupt Disable flag in the Status (P) register. However, this effectively de-activates the Eye. Note also that to protect the background program, HIMEM must be set at 32624 before a foreground program is run.

Using the System

Figure 2 shows the menu options provided by the Eye program. First, since the clock had been set to Eastern Standard Time, I used option A to turn the clock back three hours to conform to Pacific Standard Time. The light next to my computer is controlled by a remote BSR module, so I tried the light timer next. After setting the house code using option B, I selected the light timer option. I set the timer to turn the light on in two minutes and turn it off one minute later. I then instructed the program to activate the timer. The Eye informed me that the timer had been activated and advised me to turn the screen off.

At the appointed time the Eye wrote the message CHANNEL 1 ON to the screen, beeped and turned on the light. "It works," I thought. Then the message was repeated, followed by another beep.



```
A. SET CLOCK / READ CLOCK

B. DEFINE HOUSE CODE

C. DEFINE SWITCHES AS N/O OR N/C

D. DEFINE ENTRY DELAY TIME

E. DEFINE EYE AUTO ON-OFF TIMES

F. STATUS OF DETECTION SWITCHES

G. ACTIVATE EYE AND LIGHT TIMER

H. ACTIVATE LIGHT TIMER ONLY
```

Figure 2. The Eye Menu.

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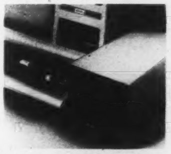

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Another message and another beep. I turned the Apple off, popped the lid and checked the connections. Nothing seemed wrong, but I pulled the card and reseated it. I rebooted the system, reprogrammed the light timer: activate, message, beep, message, beep, message, beep. After 18 messages and 18 beeps, the message CHANNEL 1 OFF was displayed. Then a beep, and the lights went out, followed by 18 messages and 18 beeps.

> ***I doubt that it would wake me from a sound sleep. Nor do I think it would scare a self-respecting burglar.***

The constant number gave me a clue to the problem. I listed the program and my suspicion was confirmed. The program checks the time and cycles through each of the 16 channels to see if the channel needs to be activated. The software checks only the hour and minute, however, so the first instance that the time is correct, it sends the turn-on code to the BSR module, prints the message and beeps. It then checks the other channels, and when it returns to the first channel, about three seconds later, the time still is correct, so it goes through the same process and continues until the minute number increments.

Thanks to the unlocked software, I was able to solve the problem easily with a bit of re-programming.

Turning to the alarm system, I hooked up one of the magnetic switches to channel X. Holding the switch in one hand and running through the menu, I activated the Eye. I slowly moved the two sections of the switch apart and the alarm went off. The sound was definitely louder than the Apple beep, but I doubt that it would wake me from a sound sleep. Nor do I think it would scare a self-respecting burglar. I plan to add a siren.

I tried the system in both fore- and background modes, activating both manually and automatically. It all worked by the book. Having completed the bench test, I began to put the system to work by stringing a wire to the front door and mounting the switch. I ran into a problem, since the door is recessed in the frame and the magnet part has to be within ½" of the switch part. I found that a part of the frame had warped slightly, allowing just enough room to mount the switch without interfering with the opening or closing of the door. If you should face the same problem, there are smaller switches available that will fit into tight places.

Once again I ran through the tests, but just as I became convinced that the system was working perfectly, the alarm went off although the door had not been opened. I checked all the connections, ran a few resistance checks—everything looked good. I rebooted the system and after a few minutes of perfect operation, another false alarm. This time I noticed that the lights had flickered slightly. I tried to cause a false alarm by wiggling the wires, pounding on the door, and turning lights and appliances on and off without success. Finally, as the refrigerator kicked in, another false alarm occurred.

I recalled information in the user manual on electrical noise triggering the Eye. There it was, the problem and the solution—an RC filter, using a 470 ohm resistor and a .01 mfd capacitor, should solve my problem, according to the manual. After a quick trip to Radio Shack, I tried the fix. After several minutes, another false alarm. The fix had not worked.

Checking and rechecking showed nothing wrong. I had started to tear out my hair when my wife entered with a box of electronic parts and suggested that something in there might be what I needed. Suppressing the urge to give her a crash course in electronics theory, I looked at various ICs, transistors, resistors, and other junk until I happened to see a 10 mfd electrolytic capacitor. Figuring that I had nothing to lose, I hooked it up and it worked!

Since putting in the fix, the system has worked exactly as the documentation says it should. With the system activated, if anyone triggers the alarm, the Eye immediately turns on all lights using BSR channel 15. This serves as a welcome light to members of the family coming home or as a warning to a burglar. If the system is not de-activated within the selected delay time (either by a RESET or simply by turning the computer off), the Eye turns on all other lights controlled by BSR modules, sounds the piezo-electric alarm and activates the phone dialer if one is connected. It will also send another signal using BSR channel 16 to turn on the optional siren.

The Eye survived several power failures. The back-up battery kept the real-time clock alive. After the power returned the disk in drive 1 rebooted the Eye which then picked up where it had left off. If the schedule called for the Eye to have activated itself during the time

Patch to Remove Beeps

Use the following procedure if you want to get rid of the beeps:

Warning: Make changes to a back-up copy first, until you are sure the program is working correctly.

1. Hit RESET and type BLOAD TRANSMIT.
2. Get into the Monitor by typing CALL -151.
3. Type 8142.8145. You should see 8142 - 20 DD FB 60 on your screen. This is the JSR to the Monitor BELL2 subroutine.
4. Type 8142:60 EA EA EA. Repeat step 3 and you should see 8142 - 60 EA EA EA. This changes the JSR to an RTS.
5. Type BSAVE TRANSMIT,A$80E0, L$D0.
6. Type RUN EYE and check the light timer program to verify that the beeps are no longer there.

If you don't want to see 18 copies of the same message, use the following procedure:

1. Hit RESET and type LOAD EYE.
2. Type in the following lines:

```
  10 DIM CN(16), CF(16)
4530 IF (HR + MI / 100) < > (TT(1,X) + TT(2,X) / 100)
     THEN CN(X) = 0: GOTO 4600
4532 IF CN(X) THEN 4600
4535 PRINT "CHANNEL ";X;" ON": CN(X) = 1
4600 IF (HR + MI / 100) < > (TT(3,X) + TT(4,X) / 100)
     THEN CF(X) = 0
4602 IF CF(X) THEN 4680
4605 PRINT "CHANNEL ";X;" OFF": CF(X) = 1
```

3. Type LIST 10: LIST 4530,4605 to check that the lines are entered correctly.
4. Type SAVE EYE.
5. Type RUN EYE and check that the system operates correctly.

Note: if you don't mind one beep when a channel is turned on or off, just make the changes to the program only and leave Transmit unmodified.

of the power outage, it did so immediately after the power returned.

Evaluation

Overall I am very satisfied with the Eye. The installation is not too difficult, and the manual seems to have covered all the bases. I would have appreciated a more detailed technical explanation of both hardware and software, but I expect that most people purchasing this system will not require such details.

There are a few troublesome aspects of the system, however. The RC filters should have been included on the board or space should have been allowed for them because other users also may have problems with spikes. The location of the capacitors that I installed to solve the problem could interfere with a card in slot 5.

The location of the terminal strip at the top, close to the Apple cover, may cause an accidental short (I used electrical tape to prevent this). The side facing the back of the Apple might have been a better location for the terminal strip. In addition, the terminal posts, especially the grounding terminal, are small, making it difficult to connect stranded wires. These are minor flaws in an otherwise good design.

A flaw in the software is the limit on the scheduler. The present system allows only one on-off cycle per BSR channel in a 24-hour period. Also, there are no provisions for programmed changes to the schedule, i.e., each day is identical to its predecessor. For example, you cannot specify that the TV comes on at 8:00 p.m. on Wednesday and at 7:00 p.m. on Thursday, or that you want the bathroom light to go on and off three times during the evening.

The ability to introduce an optional random factor, say ±15 minutes, to the turn-on/off times would be a good feature to add, as would be the ability to control the start of a sequence based on input from an optical sensor measuring the amount of light outside. The Eye also fails to take advantage of the ability of the BSR system to dim or brighten individual lights.

Another limitation is having to install the controller in slot 4. This is necessary because all the PEEKs and POKEs needed to access the card are hardcoded to slot 4 addresses, but it may conflict with other cards which require installation in that slot. The system would be more flexible if you could specify in which slot you had installed the controller.

I intend to make software changes to provide these additional capabilities and I would be interested in hearing from readers who have made custom changes.

In general, the real-time clock works well with programs running under DOS, but there are no provisions to use the clock in Pascal or CP/M. To protect the clock routine from being overwritten, HIMEM must be set almost 6K lower than its value after boot-up (32624 vs. 38400). If you run the Eye in background and run a fairly large Applesoft program with hi-resolution graphics, you may find that the Apple spends an inordinate amount of time "garbage collecting," because of the small amount of memory left over for strings. If you use the clock function in your own programs, be aware that the manual has reversed the memory locations for hours: Location 32740 contains the "ones" and 32741 the "tens" of hours.

Commercial software packages, using modified operating systems, are generally not compatible with the Eye, as they tend to destroy any program in background. Since the IRQ interrupt line is usually not masked, however, you may see some unpredictable effects if the system is triggered. You might have to resign yourself to the fact that you cannot play *Frogger* and feel secure at the same time.

The Eye is an attractive alternative to other commercial security systems for Apple owners.

Summary

Aside from some limitations, the Eye is a quality product and an attractive alternative to other commercial security systems for Apple owners. Atari and Vic 20 versions of the Eye should be available soon from Lehigh Valley Computer. The system is relatively easy to install, and all options are menu-driven. Unless you accidentally set off the alarm at 2:00 a.m. and your neighbor comes over to punch you in the nose, it is very hard to get into trouble. When all else fails, a RESET cures all. The basic package sells for $250.

I plan to test some of the optional accessories that interface with the Eye, such as window breakage detectors, heat detectors, ultrasonic motion detectors, mat switches, and a phone dialer. I am going to have fun rewriting the existing code to provide additional features. This capability alone is worth the price of the package.

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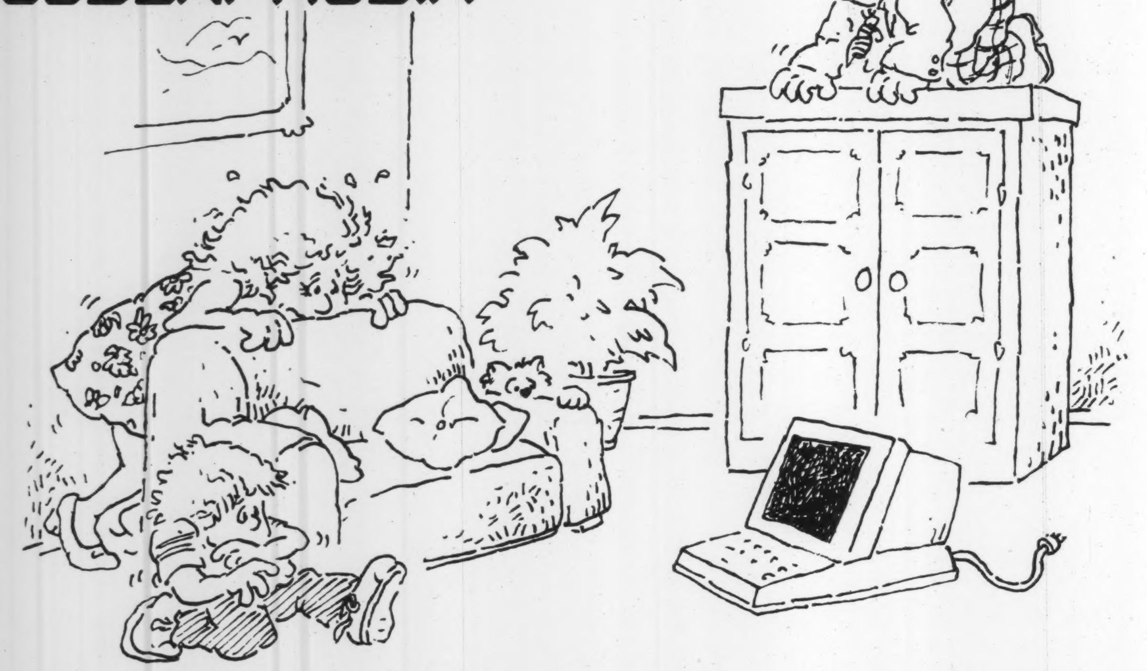

Illustrations by Wayne Kaneshiro

John J. Anderson

"What—me a cyberphobe?" You may scoff at the accusation. I realize you are reading a computer periodical, one, in fact, which usually makes the assumption that its audience feels quite comfortable around small computers. Yet a good deal of the material we present assumes advanced knowledge on the part of our readers.

In actuality many of our readers are in a more or less fledgling state when it comes to computers. They want to know more—they want to be comfortable with the material, but are finding it to be tough going. There is so much to learn, and so much prerequisite, that it is difficult to find a handle, to know where to begin. I remember how I felt the first time I ever leafed through the pages of *Creative Computing*; it was like nothing I had ever seen before. Although the words looked a lot like English, I was able to understand very little.

The people I wish to address here are in that beginner category. They may or may not own microcomputers. They are making an effort to educate themselves, but are intimidated, whether or not they openly admit it. Intimidation, with its longtime partner, fear, are extremely effective blockers of learning. My goal here is to loosen their hold. Even if you are on intimate terms with one or more CPUs, you may find the following to be of interest.

Of Mainframes and Myths

Let's step back a little, and attempt to gain a long range view.

Way back in April, 1969, *Psychology Today* addressed the question of the impending "computer revolution." It took stock of tools vs. tolls in the ascendency of the computer. We are still asking, and will be for some time, what price will be exacted from humanity, relying increasingly on computer guidance, as it courses headlong into the twenty-first century.

> ***I remember how I felt the first time I ever leafed through the pages of* Creative Computing; *it was like nothing I had ever seen before.***

The prospects offered then were tinged with warnings, but rather cautiously cheerful overall. In the pages of that issue, B.F. Skinner and Dean Wooldridge unabashedly argued for the point of view that man is a machine.

Marvin Minsky tackled optimistically some of the philosophical and engineering problems in the modeling of intelligence. Isaac Asimov went so far as to say that "the human brain is made up of a finite number of cells of finite complexity, arranged in a pattern of finite complexity. When a computer is built of an equal number of equally complex cells in an equally complex arrangement, we will have something that can do just as much as a human brain can do to its uttermost genius."

Those are the kinds of assertions that evoke, unknowingly and unintentionally, grave consternation among the cyberphobic.

Asimov, in a follow-up piece, spoke of the "Frankenstein Complex," which he

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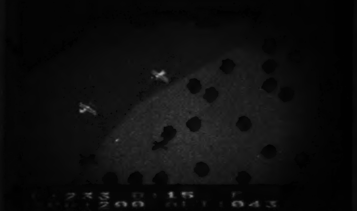
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coined as the generally accepted and deeply internalized notion that, as put forth in an occasional Late Show, some things were simply never meant for man to tamper with. He attempted to puncture the myth, but I got the strange feeling he had strengthened it with his earlier prediction concerning intelligent machines.

I have great respect and admiration for each of these authors, and in fact share their hopes for the future. But, with their unbridled predictions, they were certainly fueling the pyre at the time.

They can hardly be blamed for it—in 1969, there was a different perspective. One facet of this perspective was that computers were huge, unwieldy, unreliable nests of multimillion dollar spaghetti. It is not inconsistent that informed opinion, then, had grown so dramatically imposing as to nurture Promethean visions.

Today computers fit on the head of a pin, and while they still sometimes evoke images from Orwell, they are at least physically less forbidding. They are also encroaching upon us irrevocably, inexorably, and unceasingly. They sneak up on us in various forms we may not immediately recognize: they are in our toys, our tools, our timepieces. And today $125 will buy the computer power that cost $125,000 in April of 1969.

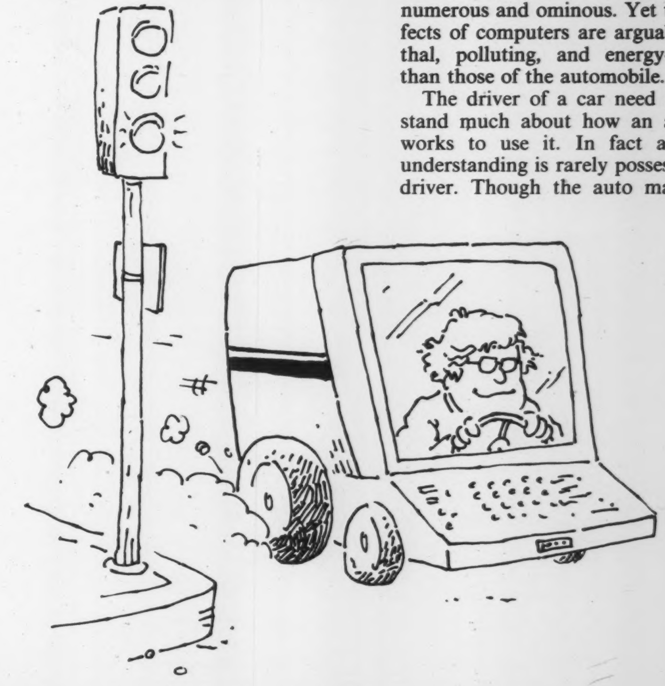
Doubtless, we must overcome our inhibitions concerning computers before we can effectively direct their proliferation. This is a lasting challenge to educators.

It is nonetheless clear now that educators themselves have done more to foster fear and trembling about computers than any group of axe-wielding Neo-Luddities. Even sane people (I include myself) have spent weak moments pondering whether and when the microwave oven was going to begin barking orders.

Apperception Without Apprehension

"Cyberphobia" is a term of growing usage, import, and incidence. Courses across the country now attract members, young and old, of a new and needful group: those willing but unable to understand much about computers, owing to a chronic anxiety concerning them. The term is no passing bit of Valspeak or computer jargon. It describes a tangible and often socio-economically debilitating malady. I, along with many others in the field of computers and education have worked to create programs that help cyberphobes break the grip of fear and gain some insight into a remarkable direction upon which the human race has lately embarked.

Educators themselves have done more to foster fear and trembling about computers than any group of axe-wielding Neo-Luddites.



His CRT Has Wipers

When dealing with cyberphobia, a favorite analogy of mine concerns computers and cars; I have heard much criticism of the comparisons, but indulge them for a moment. The car is a lever of physical mobility. The computer is a lever of mental mobility.

The advent of the automobile radically altered our perspectives. The scope of our daily environment, as well as our grasp within that environment, was entirely redrawn. As its popularity grew and costs dropped, the alterations wrought by the car became permanent and unilateral. The changes have been changes for good and ill. The benefits are obvious, and undeniably, the gains have been strewn with lamentable compromise.

So it is with computers. They are swiftly changing the fabric of society as informational, educational, and recreational tools. These innovations will serve not only a technocratic elite, as has been suggested by some; they will be so cheap as to be readily available to all who desire them. They will become easier and easier to use. There exist already serious potentials for misuse; these are numerous and ominous. Yet the side effects of computers are arguably less lethal, polluting, and energy-dependent than those of the automobile.

The driver of a car need not understand much about how an automobile works to use it. In fact a thorough understanding is rarely possessed by the driver. Though the auto makers have done their best to obscure the fact, a car is less an end in itself than it is a means; it is used to reach some desired destination.

This is also true of the computer. The user can decide how much or how little to become involved with its internal workings. He may choose to learn little about the machine and still gain a great deal from its use.

Some people become disoriented when they think about computers because they make the mistake of asking what computers do, expecting a single answer. Computers are multi-purpose machines. In contrast to the cotton gin, butter churn, and safety pin, computers are designed with no sole, dedicated purpose in mind. Only upon execution of some certain and specific program will any "destination" be reached. The universality of the computer is in itself threatening—perhaps to some as threatening as being run over by a car, only more insidious. There are many different and subtle ways to be squashed, you see.

During those first experiences behind the wheel of a car, a learner experiences fear. This is natural, even necessary, to learn control and proper operation of a machine as powerful (and potentially dangerous) as an automobile.

Most important, there is but one way to overcome this fear: to drive. After many hours on the road, a modicum of confidence is obtained.

> ***The only way to conquer fear of computers is to get to know them.***

The only way to conquer fear of computers is to get to know them. My advice to the timid: sit in front of one as soon as possible. Remember, it is much more difficult to kill yourself or others staring at a video screen than peering out of a windshield, even in your first minutes at the console.

To judge computers without having touched one is like learning to drive by studying geography. And yet many people, especially and unfortunately otherwise intelligent people, have done just that. Until you sit down and start interacting with a computer, you have not even turned on the ignition, so to speak.

And knowing how to use computers is already as necessary a skill for many as knowing how to drive.

Belletristic Computing

Some people have accused me of being obsessed with computers—of being in the worst case "cyberphenic" in my attitude. I deny this. My penchant for computers grows not from any compulsion to program or natural affinity for number crunching. On the contrary, I am a word-oriented person, disenfranchised in large part from the world of mathematics (as were many of my kind at an early age, no doubt as a result of archaic teaching methods). I am "right-brained," to further abuse a much-celebrated thesis.

No, I have no programmable calculator dangling from my belt, and the word "calculus" still induces weakness in my knees. I have always had trouble with long division, and though I greatly admire the unshakable foundations of the hard sciences, I will usually skip the math, taking the theorist's word that the results invariably fit the facts. And that is one reason I love computers. They do my math for me.

The microcomputer, for me and a growing number like me, is not an end in itself. It is a means to an end. The creative potential of the micro is in a sense limitless and certainly goes far beyond balancing checkbooks or processing words. Among my own interests are

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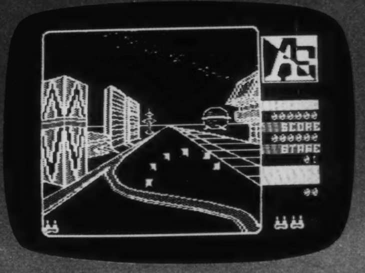

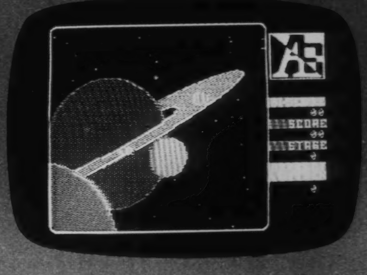

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computer graphics and sound, and their use in education.

Okay. You might now have a better idea of what a microcomputer should be. I've gassed you up, and you're ready to "get behind the wheel." Next question: where to?

Let's do exactly what I cautioned against above, namely, summarily survey some geography; in order to carve a foothold we shall take a guided tour of some major software destinations in an effort to underscore three promising directions. The inclusions and omissions of course reflect my own biases, and what follows should not be construed as definitive in any way. What I wish to provide is a group of starting points. As more and more "right-brained" types invade the field, the scope and quality of this software will continue to soar. I enjoy imagining that some of the minds that will take part in the process are reading this now.

Enriching Education

Remember Rubik's Cube? I spent a dozen hours or so learning to solve it, as have a few million other people around the world. Mathematicians were simply tickled pink with the physical embodiment of mathematical set theory the cube presented. In fact, Professor Rubik originally designed the cube as a tool to teach the concept to his own students.

The thing that excites math teachers about the cube is the way it can impart an intrinsic sense of how it works to its users. What is to be stressed is that no kind of learning is more effective than "hands-on" experience: in learning to solve the cube, the user gets a "feeling" for set theory.

Things didn't turn out quite as dramatically as the MIT boys predicted in 1969.

Now imagine the graphic potential of the microcomputer to embody mathematical concepts. Several microcomputer programs, for instance, simulate a Rubik's Cube, with one slight improvement—the user can see all the faces of the cube simultaneously. This provides a more complete idea of what is happening as the faces spin. The microcomputer is unparalleled at providing this kind of tutorial power. Software developers who tap this potential are making the best use of the micro as an educational tool.

One name should spring to mind during any examination of educational software for the microcomputer: Seymour Papert. If you are interested in the topic of microcomputers and have not read his book *Mindstorms*, you are ill-prepared for this decade. Papert is a long-time crony of Minsky at MIT, as well as one of the venerated group of geniuses who spent the late sixties making optimistic predictions for the field they called AI, for artificial intelligence. I'll be addressing the question of AI a little further on.

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Things didn't turn out quite as dramatically as the MIT boys predicted in 1969, nor on the predicted timetable. However in the interim, Papert took a language of his inner circle, Lisp, which is a powerful structure of lists built upon lists, and whipped it into Logo, a language that is now revolutionizing the elementary school classroom.

For years now, some educators have had the extremely unfortunate notion that computers are tools for only drill and practice—and so developed a field they called CAI, for computer-assisted instruction. Papert refers to this as the computer programming the learner. A computer is tirelessly terrific at administering drill and practice, and I believe there is a place for drill and practice in learning. But care should be taken that drill and practice never becomes the only purposes for which microcomputers are touched by students. The misuse of CAI has surely in some cases exacerbated latent cyberphobia.

A much preferable situation, states Papert, is one in which the student tells the computer what to do. That is a goal of Logo—to provide a language whereby the user "teaches" the computer how to complete a certain task. Turtle graphics, as an example, use this approach to help young children develop an intrinsic sense of geometry. The user does a great deal of learning in the process, of course. Learning about solving big problems by breaking them into groups of smaller problems; learning about logical thinking; learning to express solutions; learning that computers are tools to be manipulated by the user, not vice versa. These are indispensable lessons.

How soon should these types of interactions be introduced to the student? Some evidence indicates that kindergarten may well be too late, but I would confidently state that a first grade class will benefit greatly from access to a machine that runs Logo or another language with simple but pretty graphics and sound capabilities. Motivation of children will quite often be unnecessary—a teacher needs simply to work with them at their pace to achieve the results the children desire. Piaget would have been proud.

Another important group of educational programs (though they are often not viewed as such) are simulations. Rubik's Cube programs are simulations of an actual cube. In other simulations, the user sits in the cockpit of a 747 or on the throne of a medieval city-state; at the helm of a supertanker, perhaps, or even at the controls of a nuclear reactor. In situations otherwise dangerous, costly, or impossible to recreate, the computer can simulate the major factors that obtain, giving the students valuable first-person experience. I have been heartened by the joy of a group of fourth graders who have just avoided a meltdown. An

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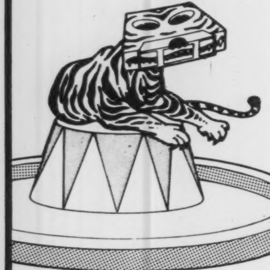

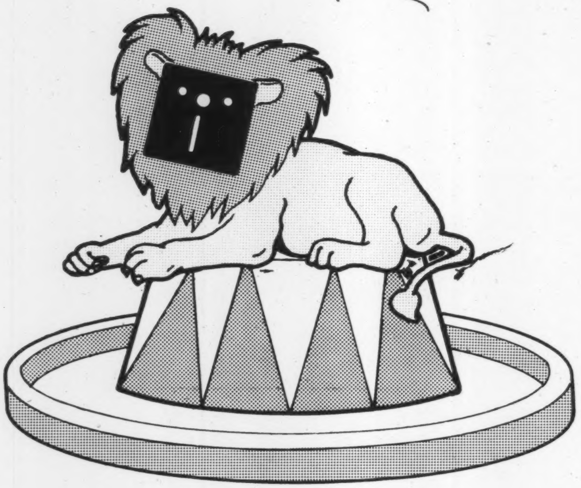

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experience of this kind does much more for a child than merely hearing or reading about it. It becomes a self-motivated, reinforced, and above all, *exciting* learning experience.

Enriching Entertainment

There is much controversy today concerning the dangers of the video game. Even the Surgeon General of our nation has expressed serious concern (while admitting a lack of hard evidence) that the games are "hazardous to your health." While some seek legislation to stop their proliferation, others seek to harness the power of the video game to constructive ends.

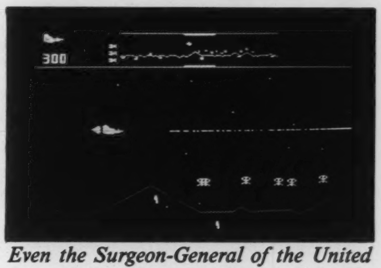
Some of the dangers associated with arcades (such as the availability of drugs and pilfering of quarters) can be rightfully ascribed not to the games themselves, but to the environment in which they appear. I think that some regulation of arcades is a prudent course. The *best* place to play video games is obviously within the home. The atmosphere is healthier there; games do not require coins, and supervision can be much more effective.

The video world is not a show. It is an interaction.

I do not think the right kinds of games are harmful in the short or long run. As a member of the first TV generation, that sat passively in front of the set, I find it refreshing to see kids who take it for granted that video screens are a two-way street. At the least, the video world is not a show. It is an interaction. The key is moderation: obsession with anything is not a good idea.

Unfortunately, a very few home video games on the market today have attempted to base sales on sexism, murder, rape, arson, and other crimes (as humorously kinky, I suspect their hype would assert). Parents must now add video play to their vigilance concerning what their kids watch, read, eat, and so on. It is only to be expected in the final score of our fast-moving century.

Likewise, I don't believe that space "shoot-'em-ups" or games such as Pac-Man are harmful. Though they may at times seem to induce frustration or violent urges, they serve much more frequently to release those feelings—something of which passive video is incapable. I reject arguments that condemn the games on the basis of eventual and inevitable loss. Those arguments are raised by folks who have no idea why anybody plays the games at all.

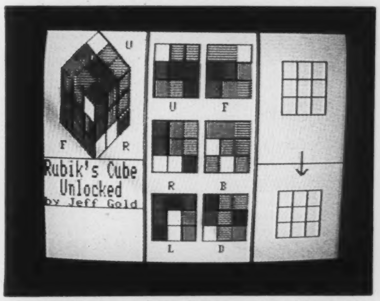


Even the Surgeon-General of the United States has expressed concerns about the effects of video games on our childen. Do "shoot-'em-ups" foster violence?

The video game poses a world—a much simpler world than our own, wherein success is very clearly defined, and for a time, clearly attainable. Through practice, a player can control this world for a while. He can escape from the anxieties of real life into a place where his own actions always count, where he can be a hero. When the game is over, he hasn't lost or been beaten. Is a surfer beaten when he flies from a wave?

Most video games call for some semblance of hand-eye coordination, and some hospitals are now using them in rehabilitation programs for brain-damaged patients. It has been found that some patients who were otherwise thought to be unreachable have been "brought out" through their use. Moreover, experimental research is now being conducted regarding the feasibility of video games as a test for drunken driving. Intoxicants act to slow reaction time and impair coordination—and nowhere is this kind of impairment more measurable than on the video game playfield. Some day a poor showing at "Six-Pack Man" may cost you your license.

Video games for the microcomputer are not restricted to mere "twitch" games, however. Strategy games are at least as popular, and among these are the so-called "fantasy role-playing" adventures. These games allow the player to construct a whole new personality, choosing strengths and weaknesses from a list of possible character traits.



A simulation of Rubik's cube allows the user to see all faces of the cube simultaneously. It may also step through a solution at the user's pace.

One might choose, for instance, a character who is extremely dextrous and swift, but these positive traits must be traded off against others, such as strength and endurance. Players have a tendency to become extremely attached to their characters. My preference runs toward brawn as opposed to brain, which probably reflects some compromise between reality and my own desires. I'm also attached to extrasensory powers, which are likewise denied to me in the real world.

After characters are created, they enter and interact within entire fantasy worlds: worlds wherein they can exercise a kind of free will, choose their fates, even experience their own deaths. These fantasy games are being used experimentally now with autistic and severely withdrawn adolescents. Though results are preliminary, they seem quite positive. To the threatened personality, interaction in an environment where even death isn't fatal can have real therapeutic value.

Interaction in an environment where even death isn't fatal can have real therapeutic value.

Even the group we typically dismiss as "normal" can derive release through adventure games. I have predicted they will become, before long, as popular a fictional form as the novel or film. A portentious prediction, but one which I assert is utterly credible.

Enriching Democracy

As I hope we begin to see, the microcomputer can do quite a great deal on its own, sitting on a desktop, coffee table, or TV cart. But hook it up to the phone lines, and you have established a new medium of expression: the telecommunications network.

Telecommunications through a home computer present a great deal of potential. The growing possibilities of travel reservations, ticket purchases, shop at home services, a broad range of databases at your fingertips, are worthy and practical. They herald a truly useful place for the microcomputer in the home.

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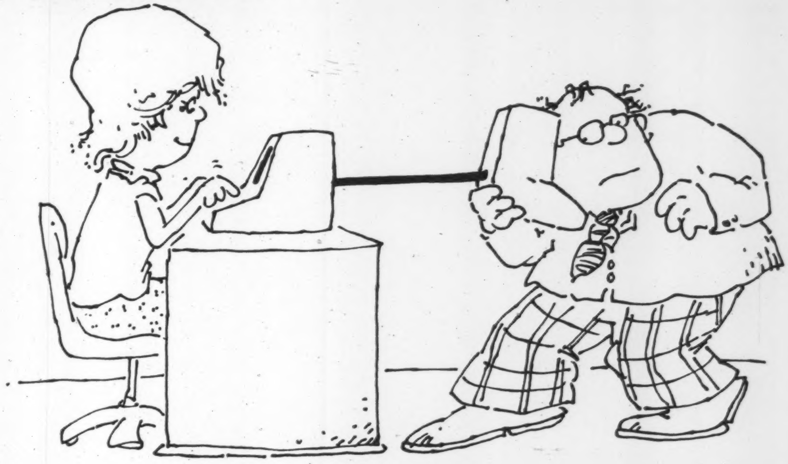


I do not believe, however, that any of these practical notions constitutes the real basis for the mushrooming popularity of modem communications. Rather, the reason many people have discovered is the possibility of establishing a dialogue. They are less interested in using a modem to pay their gas and phone bills than to state their opinions, to have their voices heard, and to respond to the voices of others.

Networks and bulletin board services are blossoming nationwide and worldwide. These are phone lines tied to computers, big or small, running programs that accept and display information sent from other computers. The concept is powerful and limitlessly extensible. It creates a new kind of forum—a medium of communication—through which ideas can be expressed, shot down, modified, and spread. The importance of this kind of interaction, and its potential, is now being discovered. It will be some time before it emerges as a medium of major influence, but it is going to happen; it is happening now.

Why should my computer communicate with your computer, you may ask, when we could just as easily converse by voice? I assert that if we were strangers, it would not be nearly so easy. Modem communication transmits information purely—untainted by ego, personality, idiolect, affect, or mannerism. The ideas only are transmitted. It is, therefore, truly an equal opportunity medium.

Further, through the use of unlocked electronic mail, I may with my data establish a sort of long term party line—I may pose questions to be answered by many over a period of months. I may respond to queries put forth six weeks ago and discussed by dozens of others before me. I may even enter into a "real-time" conversation with someone a thousand miles distant at 3:00 a.m. without feeling that my privacy is in any way compromised.

For the lonely, the bedridden, the handicapped, the advent of the telecommunications network will be an important psychological boost.

For the lonely, the bedridden, the handicapped, the advent of the telecommunications network will be an important psychological boost. Special interest boards have already made an appearance, the emphasis of which is on a single topic, such as science fiction or philosophy. This trend toward specialization is bound to continue.

Still Wary, Huh?

I'm aware that none of what I have stated so far will help you make better sense of the more esoteric components of *Creative Computing*. What I have tried to do, by way of demystification, coaxing, and a bit of hard sell, is instill in you the will to plow through the learning process—to help you understand why and how it would be worthwhile to tame your cyberphobic tendencies. And still, you are not convinced. Implicitly, I have been asking you all along to trust the power of computers: perhaps that is something you are still far from ready to do.

Well I can relate to that.

It could be that you have fallen into the same hole as many other folks: you wonder if the machines will beat us at our own game; you are hung up on the question of whether computers can think. You are in some impeccable company, believe me. Many smart people have spent many anxious hours worrying about this very concept. Their assumptions differ antithetically, but they are united in that they never get very far in their reasoning.

One problem that crops up immediately concerns the definition of the word "intelligence." A person's definition of the term will certainly dictate, in large part, his views on the subject. We have a hard enough time agreeing on criteria by which to measure natural intelligence, let alone any synthetic varieties.

The definition of *artificial* intelligence I have heard most often is something like "that which would be ascribed to intelligence if it were done by a human." This approach, of course, can get us into heaps of trouble. The chess-playing computer, for example, has forced a wide-ranging reappraisal of just what does and does not imply "intelligence" in a given context.

As is often my style, I will now casually sidestep the question to approach it from a different angle. Don't panic.

Software Celebrities

In 1966, Joseph Weizenbaum, another AI mogul from MIT, demonstrated a program he called Eliza. This program acted as a rudimentary psychiatrist, incorporating simple grammatical rules to hold limited "conversations" with its users. Though Weizenbaum has gone to great lengths to debunk the notion that anything about Eliza was in any way intelligent (he has written a very readable book, *Computer Power and Human Reason,* which makes the point), some people actually claimed to have benefitted from Eliza's brand of non-directive therapy. This horrified Weizenbaum, whose strong humanist feelings helped temper the AI bluster coming out of MIT in the early 70's. To him the idea of Rogerian sessions conducted by an unthinking computer was ludicrous.

He missed an important point, however. In a sense, the fact that Eliza employed "tricks" in order to converse, turning user's statements around and shooting them right back, was less important than what some found to be the *quality* of "her" conversation. Eliza-like programs are now available for microcomputers, and though their capabilities remain quite limited, technology is providing new and inexpensive means for the simulation of human qualities undreamed of in 1966.

Computers with increasing powers of

speech, and more important, powers to *listen* to commands, are decreasing in price. I fully expect "personality programs" to make an appearance within the next two years. They will speak, accept voice commands, undoubtedly be endowed with the ability to answer the telephone, asking whether the caller wants a voice or data connection. They will in addition provide entertaining, though limited, conversation. Talk about a user-friendly operating system!

Additional pioneers in intelligence simulation are already coming to us from the field of robotics. The first *true* robot stars, real life R2-D2s and C3-POs, of which, rest assured, there will be an unending lineage, have begun to appear. (One of them, Hero-1, will be reviewed here soon.) Whether these machines are truly "intelligent" or "conscious" will be much less important than the fact that they are fun to use and interact with.

Thinking About Thinking

I believe, as did the estimable mathematician Alan Turing, that the question of machine intelligence will die a quiet and very natural death by the early part of the next century. It will be resolved not by some sage, or by any sort of scientific proof, but as a practicality of language. Humanity will soon speak of machines thinking without a flinch. And yet, they will realize that machines will never think—at least not in exactly the way that human beings do.

Allow me to put forward another and much used metaphor. I attribute it to Donald Michie, though I have heard it in many forms.

When humanity first learned how to fly, the study of aerodynamics was coupled with, and in large part stemmed from, the study of the flight of birds. From the time of da Vinci, human attempts at flight often mimicked the real and supposed mechanics of bird physiology. These attempts were linked by a single thread—failure. No one today would argue that airplanes fly in exactly the same way as do birds. And yet both do fly.

We could, if we so desired, introduce the term *artificial flight* to describe the flight of the airplane. But there seems no need for this. The airplane does not mimic the bird; both call upon the rules of aerodynamics to leave the ground. We know these rules apply to both, that the study of these rules has enhanced our knowledge of animal flight, while the study of animal flight has advanced the cause of mechanized flight.

When thinking machines were first discussed, the term *artificial intelligence* was introduced. It may take humanity a while to realize that the term is superfluous. Machines do not think in the same sense that humans do, nor computers mimic human thinkers. Both follow the rules of cybernetics.

The question of machine intelligence will die a quiet and very natural death by the early part of the next century.

Here is a suggestion: if the idea of an intelligent machine really bothers you to the point of distraction, try using the term "syntelligence" to describe these growing capabilities. That way our friend the computer can garner some of the credit it deserves, and at the same time that nasty word "artificial" has been eliminated. Feel a little better? C'mon now. Even the tiniest bit?

Thanks for Nothing

Well, where are we left? Cyberphobes of the world, I don't know how much better off you are for this little excursion. It is as if I have sat you down and explained every reason why you shouldn't be afraid of confined spaces, somehow expecting to cure your claustrophobia. The best approach, of course, would be to put you in a small closet: first with the door open, then with it half closed, three quarters closed, closed for a second, closed for two seconds, and so on, until you were able to extinguish your fear. I would also provide an opportunity for you to meet others with the same malady.

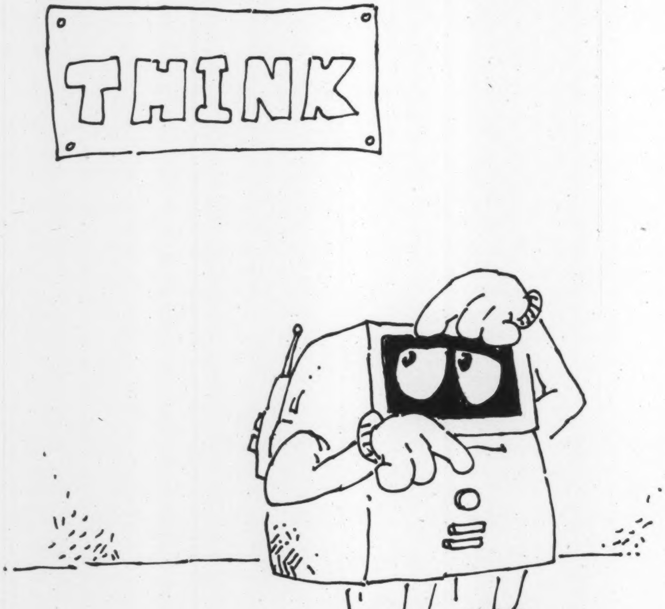
And so the question with which we are left is the following: Where can you go to receive that kind of gradual treatment for your cyberphobia?

Contact the school of continuing education at your local university, community college, or high school, and find out what "hands-on" micro courses are available. Although educators can be slow to catch on, many have by now realized that microcomputers are something worth teaching people about, and that a sizable part of this process is helping them overcome cyberphobic trepidation.

Visit your local computer store, and ask if they offer seminars. If they don't, ask why not. Then, after you have determined your needs, get yourself a microcomputer, and sit down at the keyboard. You'll be cruising in no time.

The Punchline

And by all means, keep wading through *Creative*: you'll catch a little more each time. I nearly understand it now myself! □



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Of Marriage In The Computer Age

Michael Rossman

When Kevin got a computer to do his work at home, he put it in the bedroom where the phone was, to link it to the big office machine. When he worked late he could watch the moon through the bedroom window while Mary slept in the guest room. He had hoped to interest her in his new tool, and he succeeded because she wrote her thesis on the word processor. But tension brewed between them. Assuming that Mary didn't like sleeping in the guest room, Kevin shifted the phone and computer to the kitchen and gave up the moon.

It didn't help. Three months passed before a friend of Mary's took him aside and told him why Mary was snappish and had cooled to sex. After they made love, Kevin would get up and go back to work at the console. He thought he was doing her a favor by coming to bed briefly when she retired. He had never understood that lying together afterward, talking and drifting into sleep, mattered as much to her as making love.

Talking it over at last, they agreed that he would wake her when he was finally ready for bed. This worked better for a while, though sleepy love wasn't Mary's first choice. Fortunately, a promotion soon gave Kevin his own computer at the office, cutting out his homework—and leaving him to lie abed early, alone in the moonlight, while Mary labored at the word processor till the wee hours.

Michael Rossman, 1741 Virginia St., Berkeley, CA 94703.

JUST MARRIED
P.C

As the computer revolution invades ordinary life, couples find themselves tangled in domestic conflicts involving the machine and its effects. Sometimes the difficulties are superficial and readily resolved as with Kevin and Mary. The problems, however, may run deeper, having less to do with the computer than with the people and the relationship involved.

She was jealous of the Apple as if it were another woman.

Marriage counselors are encountering a minor wave of cybernetic cases with couples who can't straighten things out by themselves. "It's another spin-off of the computer industry, a subsidiary maintenance business," one therapist told me. "It's just starting, and I expect it will grow."

The Other Woman

When Lisa found herself getting upset and angry each time Carl disappeared into the den, she realized she was jealous of the Apple as if it were another woman. She chided herself for reacting so strongly. After all, Carl was home and available though preoccupied. She was simply missing some time with him and wondered why she felt not only neglected, but resentful and incompetent.

They had shopped for their Apple together like many affluent couples buying a toy. Indeed, Lisa had pushed him to get it and had thought it would be great fun to play with it together. He would teach her to program as he learned; she would put her recipes on it, use it to manage the household budget, to help the kids out in school and attempt unpredictable marvels. She was in love with the idea, and the machine, too, at first, glossy with promises of power.

The computer, of course, was more complex and difficult to work with than she had imagined and far more stupid as a helpmate. It couldn't suggest what to have for dinner or cure their overspending. The children played video games, neglecting their homework. Nor did Lisa find herself moved to learn what she might about programming; though

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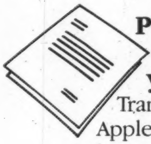

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she was bright, she found this discipline quite alien.

What upset her so in Carl's dalliance with the Apple was not simple neglect, but a jealousy deepened by her own disappointment, the failure of her own passion for the machine—which festered and stung her as Carl mastered it. Though their relationship was basically sound, it was snarled in conflict by the time this came out in therapy.

After Lisa recognized the effects of her own disappointment, they found a simple solution. Carl vowed to spend more time with her and with the children. They bought a sailboat, refurbished it together and grew adept at sailing as a team. Well before they got it afloat Carl's infatuation with the Apple had cooled. Though he still disappeared into the den occasionally to play with it, the computer had become just another toy, no longer a threat to their relationship.

"Many couples pass through a phase like theirs with some discomfort but no real difficulty," observes Dr. Arvalea Nelson, a Berkeley marital therapist. "But it's trickier when the computer isn't just a novel toy, when one partner enters into an organic and ongoing relation with it. Sometimes the problems affect the whole marital relationship, and the solutions can be quite far-reaching."

Carl's infatuation with the Apple had cooled.

Programming Your Partner

When John first moved in with Peg, he had no idea he would become a computer husband. As a drama student, Peg seemed so different from his mother, a librarian, who was domineering and compulsive about organization. But in truth Peg's character was enough like his mother's to make the relationship comfortable for John. It served Peg well when she turned to business management after graduation.

Business brought Peg to the computer, and her personality led her to enjoy it. As she learned more about programming, the obsessive-compulsive streak in her character grew stronger through constant exercise and began to affect their relationship. Peg started making lists for John—at first only of household tasks he should manage, but soon also of ways he should behave with her and things he should do to improve his performance at work.

She seemed to be trying to program him. It was so rational and benevolent, though, that John retreated into a passive aggression, leaving the lists uncompleted and the problem undiscussed. He felt increasingly anxious and overwhelmed, and went through crises of depression. Neither of them questioning her opinion that the problem was his alone, Peg convinced him to go to a therapist.

Peg quickly felt betrayed. Instead of "fixing John up" so that he could go back to getting ahead in his job, the therapist encouraged him to take a leave of absence to explore the interests he had neglected in the past and to begin making his own decisions again. With their joint income cut, Peg couldn't buy the new disk drive she wanted. By the time John started training for a new community service career, he was much happier and more in possession of himself—and Peg felt so threatened by his changes that she finally agreed to see the therapist herself.

The therapist started slowly, helping her learn to write lists *with* John rather than *at* him. Soon Peg grasped that the problem had been as much hers as his. The therapist encouraged her to express her sense of humor and the other parts of herself that she had set aside when she left school. And she realized that the one-sided persona she had developed was no better for her than it was for John. Her spontaneous, adventurous spirit, which had attracted him and had found little exercise in management and programming, was not dead but dormant. She realized how narrow her interests had grown, and she enjoyed broadening them again as she worked to develop new balances in her relations with John and with her work.

As for John, when Peg stopped using her obsessive linear streak to run his life, he found himself comfortable with that side of her again. Indeed, he depended on it when he turned to Peg for help in organizing his own work in a service agency and then in setting up a computerized business system for the whole agency.

Their story illustrates the complex ways in which computer involvement affects marriages and marriage partners. Tensions are worse when one partner becomes totally involved and the other has no connection. This happens frequently, and sometimes the outcome is less fortunate.

Hastening The Inevitable

At 28, Buzz took to computing like a duck to water, and soon broadened his company work to jet-set consulting, leaving his wife, Cathy, far behind. The more he got into it, the more she found him simply not there for her. He was withdrawn and inaccessible or speaking a language she felt she couldn't begin to comprehend. His new friends, all strangers to her, spoke it, too; he had no patience for their mutual friends.

Baffled and frustrated by his distance, Cathy decided that Buzz was boring, narrow and unexciting, and she told him so frequently. In retaliation he let her know more often that he found her dumb, and he grew more critical of whoever and whatever didn't relate to the new world he found exciting. Trapped in this dynamic of accusation and defensiveness, their marriage deteriorated rapidly. Counseling merely helped them separate on tense but civil terms.

"But their marriage was doomed even without the computer," remarked their therapist. "Neither one had enough generosity of spirit to respect the other's interests and differences. Conflict over the computer probably saved them five years of slow discovery that they didn't really care for each other very much.

"In most successful marriages partners try to develop complementary roles for themselves in each other's worlds. Cathy could have enjoyed going on vacations with Buzz when he spoke at conferences. She might not have understood his technical presentations, but she could have shared his excitement and pride in them. Instead she stayed home, resentful. Of course she needed to develop her own world more, to be comfortable with such a fringe role in his. But Buzz shot her down as inept when she talked of starting her own business, and she bought his

Their marriage was doomed without the computer.

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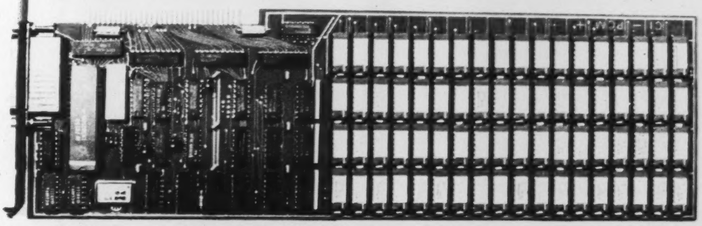

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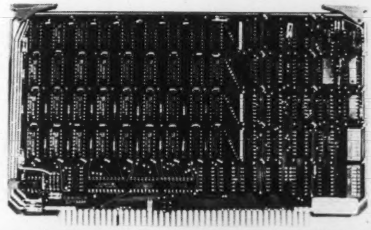

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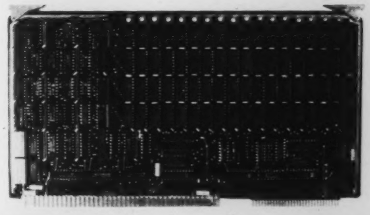

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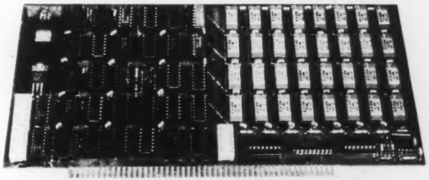

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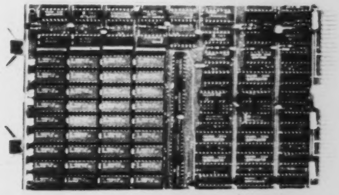

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know-it-all judgment. If he had really wanted to meet her as an equal, he could have helped her in many ways. But he wanted her to fail and success to be his alone."

A Unique Problem?

There is nothing novel or special about the impact of computers on marriages, because similar kinds of strain and conflict arise out of many expensive tools and intense enthusiasm that lead partners on separate paths. Most therapists agree that involvement with computers rarely creates new problems in a relationship, but tends instead to evoke or deepen those that are already present. Still, some argue that it can do this with unusual and remarkable force.

Computer involvement tends to be compellingly hypnotic.

"Computer involvement tends to be compellingly hypnotic, as addictive as a drug," notes therapist Marcia Perlstein. "It can be worse than another lover as a competing force for attention—totally involving, always available, and quite demanding. When your partner is not in front of the terminal, he is thinking about the problem he left behind; and when he is finally done he doesn't want to pay attention to anything, but just goes passive. Even for a mate who is not jealous and who appreciates his passion for the keyboard, it can be quite a strain.

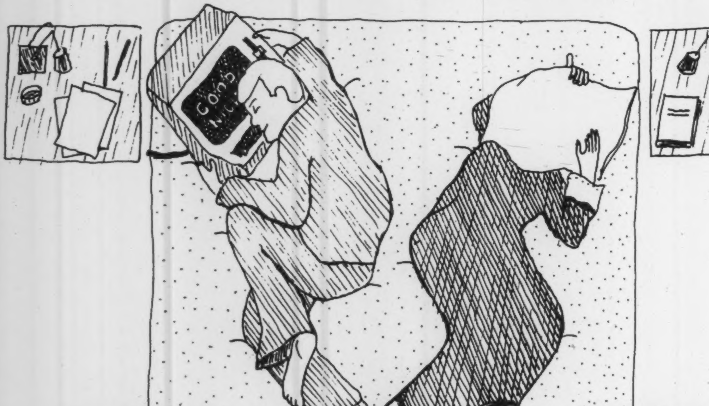
"Anyone who finds himself getting deeply involved, to the point that his computer habit becomes hard to control, will do well to find a way to make it his primary work and then to leave his work at the office. Bringing it home will probably court strain in the relationship—and many people find it all too easy to retreat even more into the computer to avoid dealing with *that*."

Sexism?

Since computers don't care which sex punches their keys, such stories of strife between women and men run both ways. In Eunice and Bob's case, Eunice was the one responsible, having a linear mind and a somewhat tight manner, which found programming a fertile ground. Bob was the free spirit and part-time actor who found unemployment romantic. He might have encouraged her spontaneity and growth, but he had put her in a box in his mind, and felt threatened each time she tried to step beyond it. By the time Eunice left him, she was well on the way to becoming a feminist. For work had been no better than home. Her women's group was the only place Eunice felt complete, a competent woman having trouble with a mate.

Still, it is primarily men who buy computers and program them, and women who stand by baffled as their mates disappear in abstract obsession. Some reports from schools suggest that a crop of 14-year-old girls excited about programming is coming along well. For adults, however, computer relations and marital problems are strongly biased along old, sexist lines. How much of this bias is due to biology and how much to social conditioning? No one knows yet, but it affects women and men quite differently.

"Women tend to have much deeper trouble in relating to computers than most men are prepared to understand," observes Perlstein. "Our conditioning leaves us alienated both from the computer hardware, and from the mathematical and symbolic languages that programming involves. This makes the challenge of involvement very threatening. Many women feel so stupid and defensive in its face that they dodge the challenge completely.



"It's not so good for a relationship, to feel that the only way to keep in contact with your mate is to understand something foreign and difficult. One tends to resent the other person, from feeling forced. And there is often a great deal of resistance to being taught, when he seems to know it all, and you feel helpless. Reactions like this strain relationships, and also cut women off from what they might do and enjoy—for many women are much better able to deal with computers than they realize—or would be if they were properly supported."

As for men, computer involvement reinforces their own sex-role conditioning in quite a different way, perhaps worse for relationships. "Men tend to find it easier not only to relate to computer hardware and concepts," agrees Dr. Nelson, "but also to use these to escape from the problems of relationships. Men's tendencies to suppress emotional awareness and expression in favor of abstraction are often encouraged by serious computer activity. Men who handle conflict by withdrawing, as many do, are at special risk in their relationships if a computer is available at home. They should take special care to be deliberate and positive about making contact with their mates—not just when things are relaxed, but when there is strain between them."

Computer programmers tend to be a fairly neurotic bunch anyway.

Problems For Professionals

The problems that computer involvement brings to marriages may be most visible and exaggerated among the people most deeply involved, the professional programmers. "Computer programmers tend to be a fairly neurotic bunch anyway, made more so by the character of the machines and tasks they work with," observes Dr. Michael Evans, a noted Berkeley psychologist. "What they do is extremely complex and abstract, and quite precarious. Large works can collapse on tiny mistakes, and do so repeatedly. One might think they would get used to "bugs," but many people never do, and find them hard to take in stride, a constant and depressing strain.

"Programmers tend to be introverted people, high achievers, prone to anxiety, and, of course, quite obsessive. It is hard to get them to take even a ten-minute

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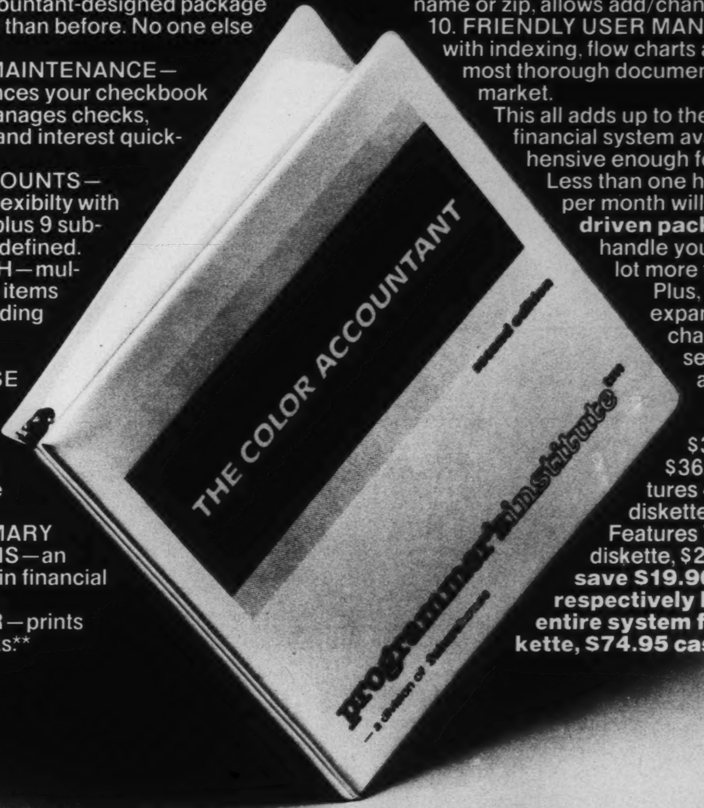

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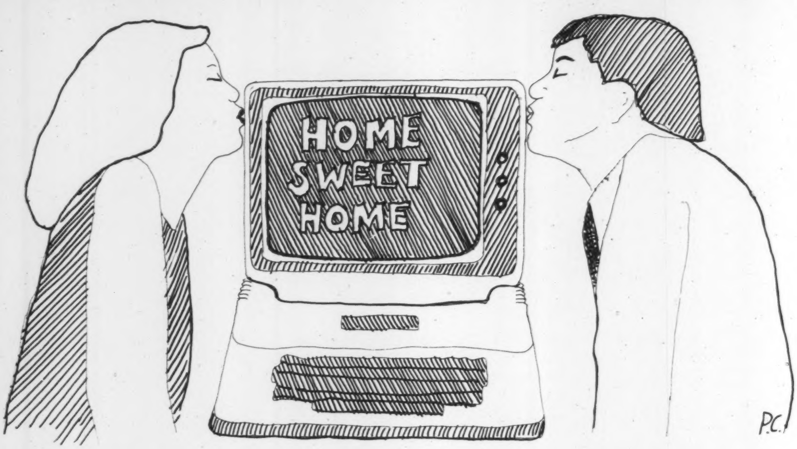
Marriage, continued...

break. All this affects their abilities to begin and to maintain relationships. Their obsessiveness makes it difficult for them to accommodate others. Their jobs are not only stressful but stretchable and flexible, expanding to fill all available hours. Their language is so special that they can't talk about their work to their wives or girl friends. On the job they interact with peers around technical matters and don't really relate to each other; their bosses rarely realize the kinds of support and encouragement they need. All this is tough on relationships. It's no wonder so many programmers find it easier to relate almost exclusively to computers, than to people, and intimacy, so much more complex and demanding."



What Dr. Evans observes about professional programmers seems to apply no less poignantly to amateurs, to the many husbands and wives now being caught up in the growing, less specialized ranks of the computer-involved. A marriage in which the partners are equally eager and able to undertake the cybernetic adventure is indeed fortunate (though programmer couples are often better at solving programming problems than couple problems, which occur no less regularly among them than among common folk). Marriages without this rare equality tend to take the advent of the computer better if one partner is already used to the other's tendency to go off in specialized obsession, and if some agreement about how to stay in contact is worked out. Without this, trouble comes with the software, like an un-indexed program.

It would be nice to wish away the problems that computers pose for marriages, or wish for some simple, dependable solutions. But the problems are real and massive, and often intractable, because they come with the medium—not only of marriage, but of cybernetics. Computer use and programming *are* all of the above—complex, demanding, consuming of time and consciousness—and a strain. In their present stage of development, they are also directly and ineluctably depersonalizing. At the same time, they are thrilling, a deep human adventure, and, in the end, perhaps not a narrow one. The strains and obstacles their use creates in relationships are an unavoidable part of the human price we are paying for the power we are beginning to grasp through our cybernetic extension.☐

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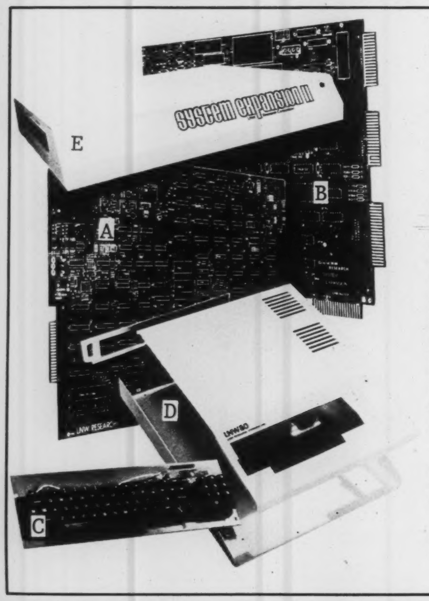

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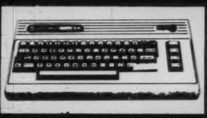

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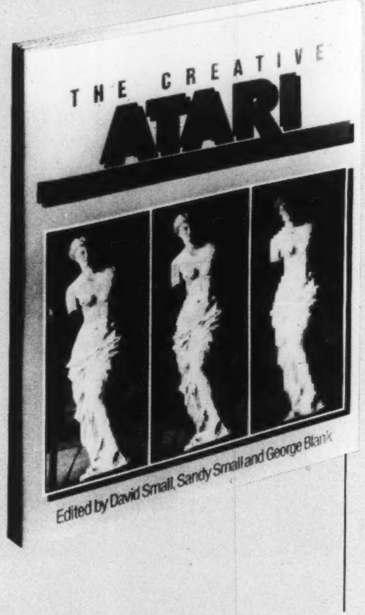

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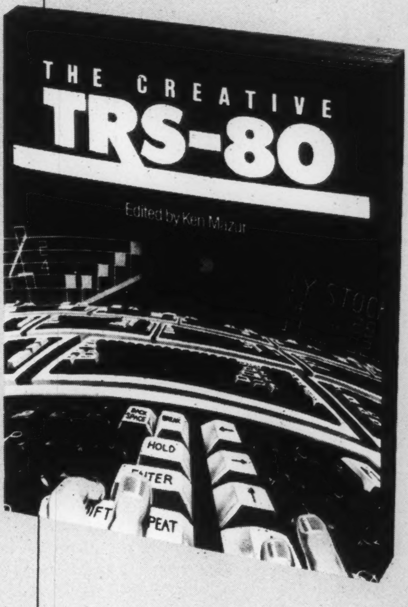

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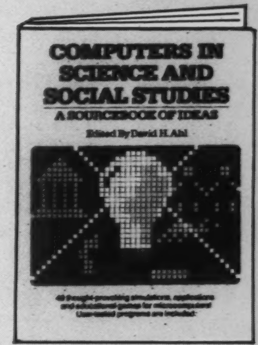

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Computers Help The Handicapped To Work At Home

Handicapped and Working

Kirby L. Morgan

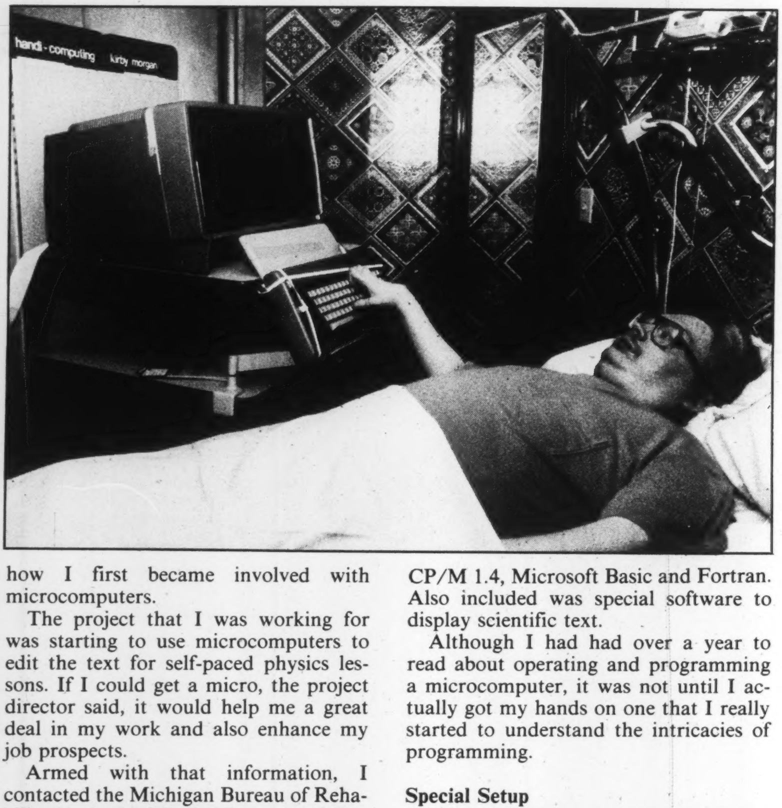
Perhaps I am not so unusual. After all, in this emerging age of personal computers, many people are starting to work from their homes. In one respect, however, I am different from most of these other "homeworkers"; I have no other choice. You see, I am handicapped.

I have had rheumatoid arthritis since the age of eight—almost thirty years now. As it does for many people, my arthritis started out as a small ache and stiffness in my joints but as the years went by, my condition slowly worsened.

In high school, I started using crutches. By my senior year in college, I had to use a wheelchair and was confined to my home. That year I had to do all of my coursework by correspondence—no easy feat, since I live in Michigan and the college was in Florida. Nevertheless, I graduated with highest honors.

For my graduate studies, I chose a school closer to home, Michigan State University. Still, I had to do all of the work at home. My perseverance paid off, however, and I obtained my master's degree in physics in 1972.

By that time, I was completely bedridden, unable to move any of my joints except for my right hand and arm. So while other physics graduates were moving on to their careers, my job prospects appeared dim. Apparently, none of the companies I contacted could even conceive of a physicist working independently at home.



First Job

Finally, unable to find regular employment, I started working part-time for Michigan State developing physics instructional materials. This was how I first became involved with microcomputers.

The project that I was working for was starting to use microcomputers to edit the text for self-paced physics lessons. If I could get a micro, the project director said, it would help me a great deal in my work and also enhance my job prospects.

Armed with that information, I contacted the Michigan Bureau of Rehabilitation in the fall of 1978, to see if they could help me purchase a microcomputer. Despite their reluctance to make such a large expenditure, the computer was eventually purchased for me, about a year later.

Finally, in February of 1980, the computer was delivered to my home. It consisted of a keyboard, a video monitor, two 8" double density disk drives, and special high-resolution videographics boards. I also got a 300 baud modem so I could communicate with other computers over the phone.

The software that I received included CP/M 1.4, Microsoft Basic and Fortran. Also included was special software to display scientific text.

Although I had had over a year to read about operating and programming a microcomputer, it was not until I actually got my hands on one that I really started to understand the intricacies of programming.

Special Setup

Being unable to use the computer physically was the first obstacle to be overcome. Since I can't move by myself, I have to be on a special bed that can be rotated so that I can lie on my stomach part of the time. The mattress of my bed is about $3\frac{1}{2}'$ above the floor—much too high to allow me to use a computer mounted on a cart of standard height.

This problem was solved by rehabilitation engineers connected with Michigan State. Their solution was to mount the video monitor and keyboard on metal brackets attached to the cart. The disk drives and mainframe of the

---

Kirby L. Morgan, Handi Computing, 319 E. Henry St., Charlotte, MI 48813.

computer were set on the top of the cart, with the metal brackets straddling them. The brackets held the keyboard and monitor high enough for me to see and reach. Then whenever I wanted to use the computer, the cart could be moved into position.

Learning to use the computer involved much trial and error on my part and a few calls to the computer store and M.S.U. for help. After about a week, however, I started to get the hang of things and was able to use the editor well enough to start writing a physics lesson on geometrical optics.

I immediately appreciated the benefits of writing with a computer. There was no more shuffling of papers. No longer did I have to mark up what I had written. I could change words, sentences, and paragraphs as I liked, and mistakes were very easy to correct. Now I could have neat looking text all of the time—a real pleasure for a finicky writer like me.

I didn't get a printer initially with my system. So in order to get my text file printed out. I had to send it to M.S.U. I did this using my modem and a terminal program that allowed me to transfer my file over the phone to another microcomputer in the physics department.

One of the other reasons that I got the microcomputer was to learn how to program. I started with Basic, although there were a few times in the first few weeks that I found I needed to know assembly language to correct a few minor bugs in the software that had come with the high-resolution videographics boards.

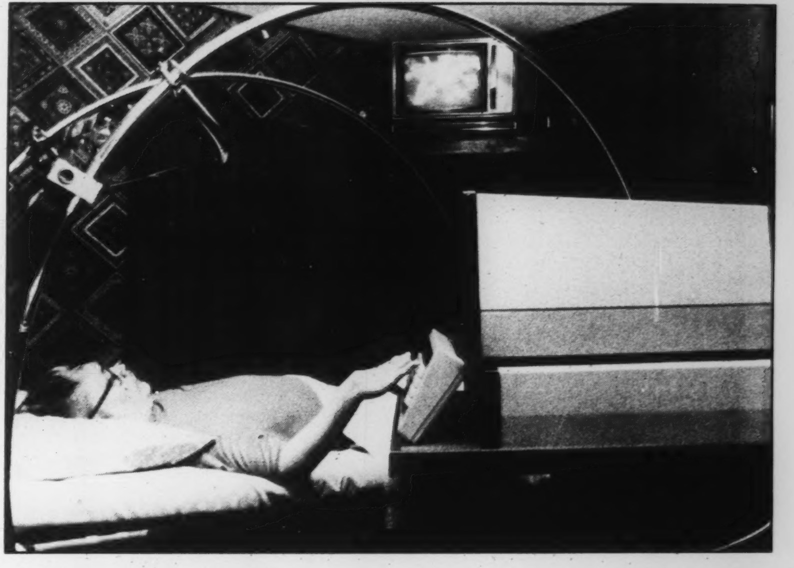
During the first six months, I programmed mostly in Basic but also did some experimenting with Fortran and 8080 assembly language. I wrote an address book program, several games, and a program for drawing graphics.

Advanced Programming

By the fall of 1980, I was ready to move on to something else. Arrangements were made for me to take the computer programming course at Michigan's State Technical Institute and Rehabilitation Center (STIRC) in Plainwell, MI. Since I was unable to go to classes, a phone line was installed between my home in Charlotte (near Lansing) and Kalamazoo, where the host computer was located.

The course that I took through STIRC helped me a great deal. It gave me an opportunity to work on a larger computer (a DEC PDP10), using my micro as a remote terminal. I eventually learned how to create and edit my programs on my computer and then transfer them to the large computer.

From the STIRC course, I learned to program in Cobol. More important, I learned more about sequential, random access, and indexed sequential files. And I was introduced to structured programming, which helped me a great deal as I began to write longer programs.



One of the strengths of the STIRC program is the strong relationship of the Center with all types of businesses in southwest Michigan. These businesses send representatives to form a committee whose members also serve on special committees such as curriculum and placement.

In the spring of 1981, one of the corporations that is very active with STIRC, Herman Miller, Inc., offered me some contract work.

Herman Miller is an office furniture manufacturer whose main headquarters are located near Grand Rapids. One of the things that they wanted to do was to be able to draw office layouts, using a microcomputer and a plotter/printer.

My job was to write several programs in Basic to create and plot the layouts. In addition, programs were needed to edit layouts after they were created and to list information about the components in each layout.

I originally wrote the programs for the TRS-80 Model III. After a few months, though, it was decided that it would be better to do it on the Model II, due to its greater disk capacity.

Because of economic conditions, Herman Miller was unable to provide me with much work beyond the plotting programs. We did have a contract, however, which paid me a small monthly fee in return for which I evaluated new software packages for them.

Herman Miller was also interested in designing special carts which could be used to hold computers for handicapped people. Using conventional shelving components attached to a main panel mounted on wheels, they were able to create a movable workstation for me. These workstations and the carts designed for me by the rehabilitation people have been very useful, allowing me to work on different computers as the need arises.

Herman Miller and Michigan State University are not the only organizations which have been helpful in providing me with employment.

The Homework Program

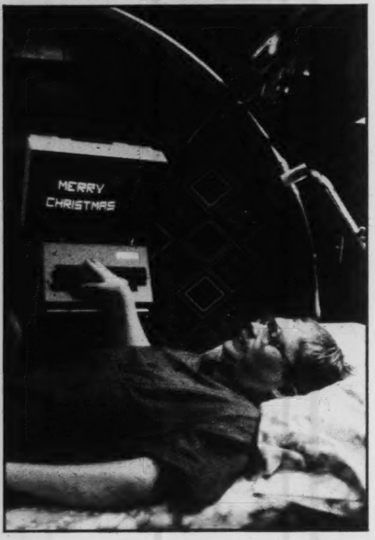
Before I even got my first computer, in 1980, Control Data Corporation in Minneapolis contacted me about working, through their Homework program. CDC has been in the forefront of the movement to employ the homebound disabled, and Homework has been used successfully to rehabilitate disabled CDC employees and other fortunate handicapped people.

Over the next two and one-half years, I had several discussions with Control Data, over the phone and in person, about going to work for them. Finally, in the fall of 1982, we signed a one-year contract.

CDC provided me with one of their newest terminals and installed a phone line to Lansing. This allowed me to access the Control Data Network and thereby be in contact with my coworkers in Minneapolis and other parts of the country.

Plato, which is the name of the system used to deliver computer assisted instruction, is particularly useful to the homebound handicapped. Users can

Handicapped, continued...



exchange personal notes (or even "talk" back and forth over their terminals) with others on Plato. In addition, general notes files, which allow groups of people to share their views in areas of common interest, are available.

My first assignment on Plato was to write a series of physics lessons dealing with oscillatory motion. I was to design them, and students at the University of Arizona were to program them.

Plato physics lessons contain graphic illustrations of physical phenomena. Students are asked a series of questions to test and reinforce their understanding of concepts, and appropriate feedback is given. Help sequences are provided when necessary, and the student is allowed to go back and review material if he wants. When finished with a lesson, the student takes a test on what he has learned.

Besides being a place to go to work, Plato has provided me with the opportunity to meet new friends. It also has given me the chance to communicate daily with people who have interests similar to mine—science educators, handicapped people, and microcomputer aficionados.

Although there are still many barriers to the employment of the homebound, they are primarily psychological and not due to any lack of technology. In the future, as more and more people work from their homes, it is important that the handicapped not be excluded just because they have been left out in the past. To do so would not only be unfair, it would be a terrible waste of one of our nation's greatest untapped resources. □

Sources For More Information

Association of Rehabilitation
Programs in Data Processing
Physically Handicapped Training
Center
University of Pennsylvania
4025 Chestnut St., 3rd Fl/T7
Philadelphia, PA 19104

Electronic Industries Foundation/
Project With Industry
2001 Eye St., N.W.
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Project on the Handicapped in Science
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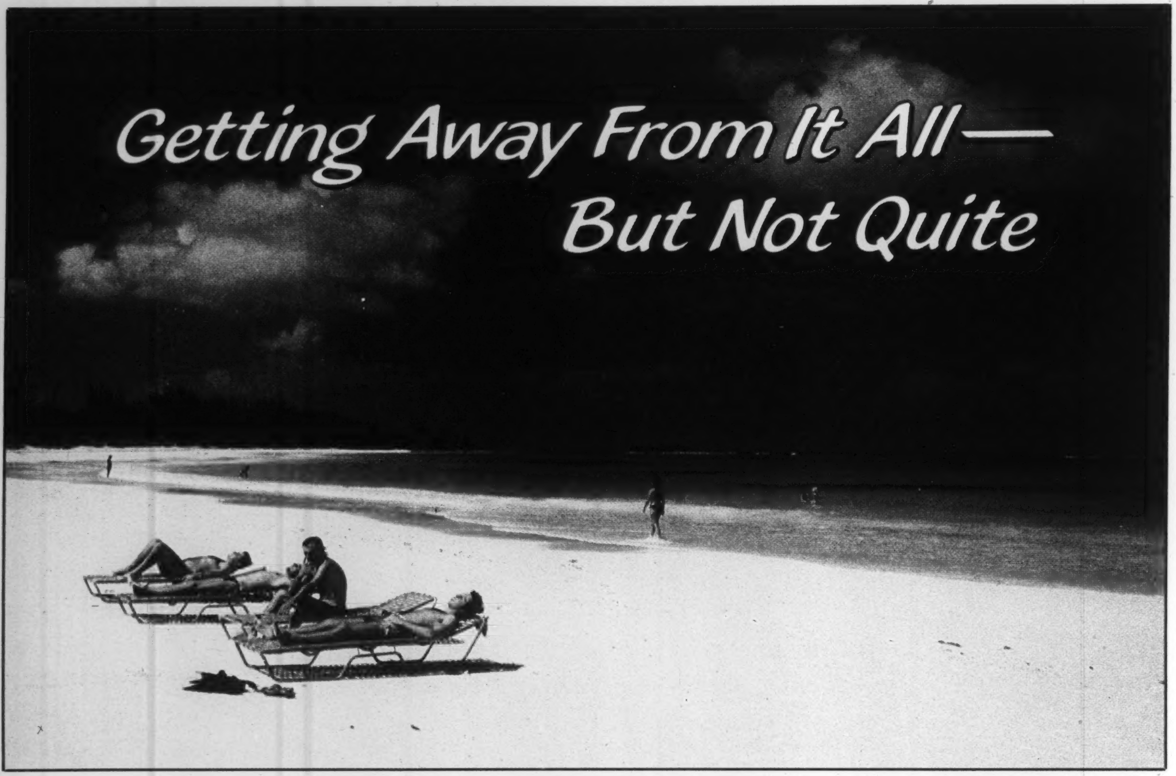


Stephen B. Gray

The brochures and ads call Club Med "the antidote to civilization" and promise a vacation during which "you'll be immersed in a totally different style of living, where there are no TVs or telephones, radios, newspapers, or clocks."

But there are computers.

In several of these earthly paradises, you can play games or even learn to program. How does Club Med justify using such civilized technology in vacation villages that have become famous as places to get away from it all?

In announcing the Atari 400 and 800 Home Computers as the "official" computers at Club Med villages in the Western Hemisphere, the chairman and CEO of Club Med, Serge Trigano, said, "The home computer will become a major force in society in the future. By offering these workshops to our members, we will be helping to demystify computers by helping our guests to understand the computer revolution."

Raymond E. Kassar, chairman and CEO of Atari Inc., added, "Club Med villages offer a perfect setting for young people and adults to be introduced to microcomputers. We believe these computer workshops will help people to understand the exciting applicability of computers to our everyday lives."

First Computer Workshop

The idea of computer workshops, or "ateliers d'informatique," originated with Serge Trigano's father, Gilbert, who in 1954 joined Club Méditerranée, which had been founded in 1950 by Gerard Blitz and a few friends. Gilbert, who started as managing director, became chairman in 1963. His son Serge is head of Club Med, Inc., which oversees the villages in the western hemisphere.

The first computer workshop was in Kamarina, Sicily, using Honeywell, French PTT, Thomson, and IBM equipment. It was so popular that Club Med introduced the computer workshop to two villages in the Caribbean area: Ixtapa on the Pacific coast of Mexico, Caravelle on Guadeloupe in the French West Indies; and later to a third, Eleuthera in the Bahamas.

Atari has an exclusive on supplying computers for Club Med villages in the western hemisphere.

Future computer workshops are planned for other locations in Europe and at the village in New Caledonia, which receives many visitors from Japan. Atari has an exclusive on supplying computers for Club Med Villages in the western hemisphere; no company yet has an exclusive for the European villages.

Newest Workshop

A computer workshop was to begin operations thus summer at the Punta Cana village in the Dominican Republic. Several new courses, including *VisiCalc* and Logo, will be offered for the first time at Club Med. A system is being installed to provide the first Club Med computerized bulletin board, which will display, on CRTs in the village, daily events and special messages to all guests.

Another first at Punta Cana will be an information system into which will be fed guest likes and dislikes, for future planning; this may be expanded to other villages.

A young vacationer keeps up his arcade skills.

Atari at the beach — wonder how those disk drives like the sand.

Eleuthera Workshop

The computer workshop at Eleuthera offers lessons in Basic programming, for children at two different sessions in the early afternoon, and for adults in the late afternoon. Six lessons are taught, and all can be taken within a week, Monday to Saturday. Children can play games for an hour beginning at four; adults have a game hour beginning at six.

One of the Eleuthera instructors during the summer is Jean-Paul Boyer, who teaches in a Paris school of electronic engineering during the academic year. During summers and holidays, he goes to Club Med computer workshops to teach and "to oversee what's going on, to help computerize the villages."

One summer afternoon, he taught Basic to three American adults: a woman who was a programmer at IBM for eight years, is now in a staff position, and is interested in the IBM Personal Computer; an electrical engineer who works in quality control; and a lawyer.

Workshop at Caravelle

The Caravelle workshop had eight Ataris last year, and will have 25 eventually. The Atari 400, with its easily cleaned "monopanel" keyboard is preferred for children, and the 800 with its standard keyboard for adults.

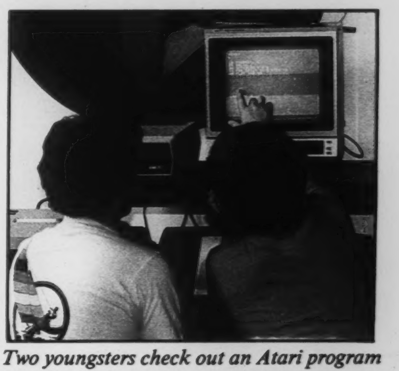
There are no separate hours for adults and children at Caravelle, which also offers a language lab, since Guadeloupe is French-speaking. The head sports instructor has been taking Atari Conversational Spanish, because of the influx of Spanish-speaking visitors from Columbia, Venezuela, and other South American countries. The course includes phrases that are first shown on the screen and then spoken aloud from the program cassette in audio mode. Adult programs include word processing and stock analysis; children's programs range from *States & Capitals* to *Number Blast.* Games on hand range from *Backjack* to *Space Invaders,* from *Eastern Front* to *Breakout.* All the programs are in English, but several are being translated into French by the instructors. All instructors speak both French and English and can teach in either language.

While all the programs are in English, several are being translated into French by the computer workshop instructors.

Instructor Yvonne Tournadour critiques a graphics program written by a New Jersey schoolteacher at the Caravelle workshop.

Computer workshop staffers receive training at Atari headquarters in California, after being selected, according to Trigano, by computer. One of the instructors said Club Med hopes to have computers in 45 villages within two years; there are over 90 villages worldwide.

Asked why computers are featured at telephone-less Club Med, Serge Trigano answered, "We believe computers will be part of our life tomorrow. The computer is another civilization." Are the workshops meant to counter the general decline in travel? "I don't think computers will attract people who go on vacation," said Trigano. "Maybe, though, they'll choose one club over another, if one has a computer workshop and the other doesn't." ☐



Two youngsters check out an Atari program in a Basic class at the Club Med computer workshop in Eleuthera.

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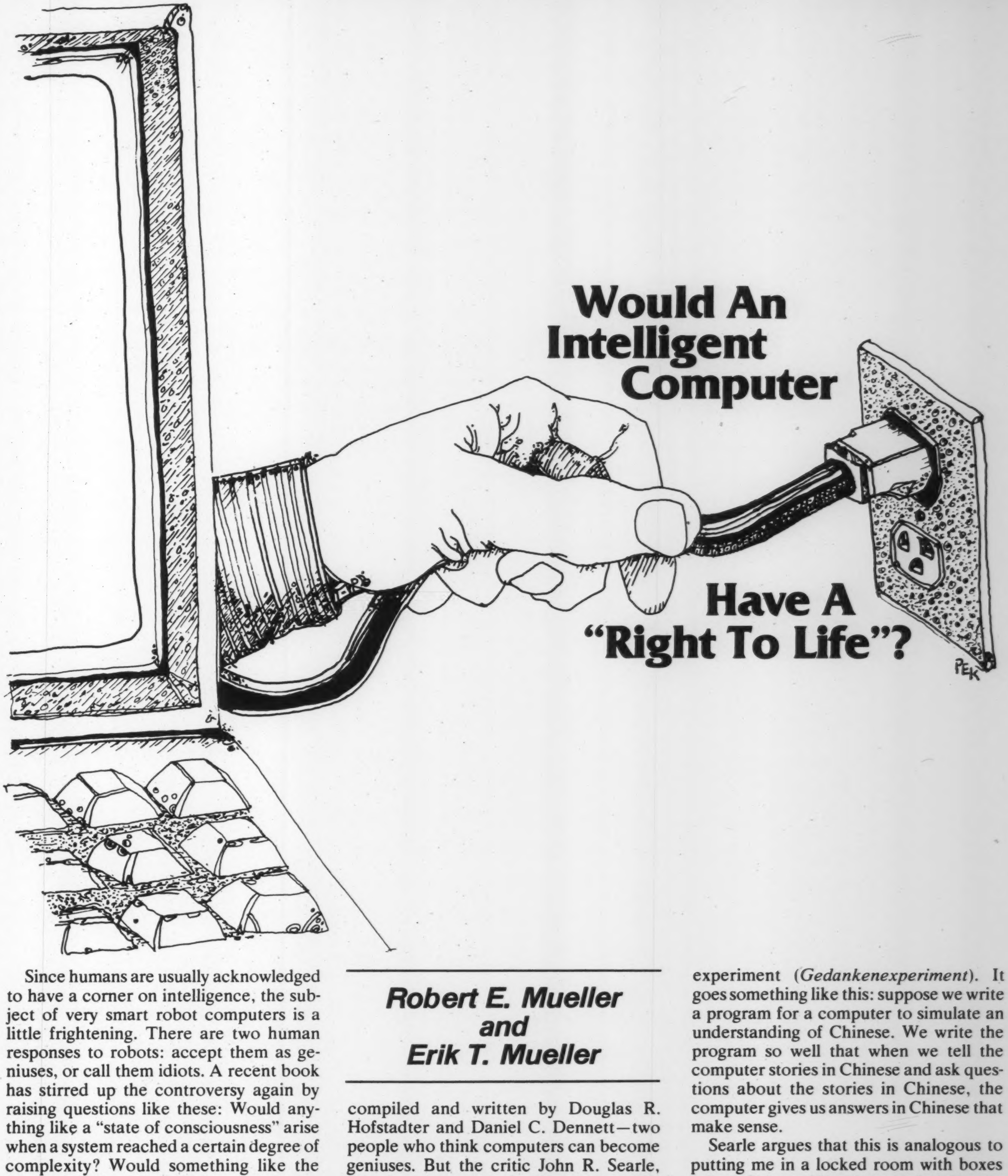
Would An Intelligent Computer Have A "Right To Life"?



Robert E. Mueller and Erik T. Mueller

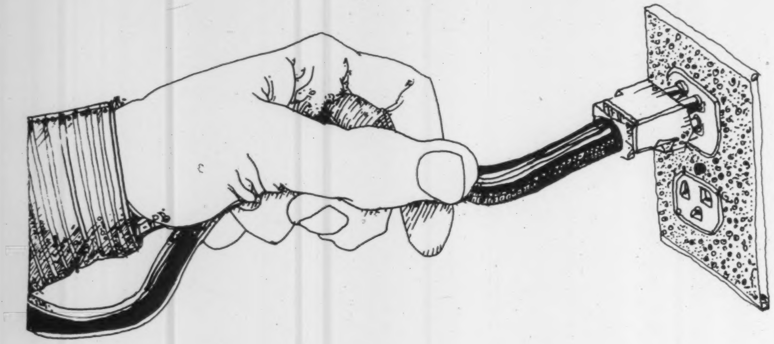
Since humans are usually acknowledged to have a corner on intelligence, the subject of very smart robot computers is a little frightening. There are two human responses to robots: accept them as geniuses, or call them idiots. A recent book has stirred up the controversy again by raising questions like these: Would anything like a "state of consciousness" arise when a system reached a certain degree of complexity? Would something like the human soul be generated in a very complex and intelligent computer—a "ghost in the machine"? As we put it: Would an intelligent computer have a right to life?

The book in question is *The Mind's I: Fantasies and Reflections on Self and Soul,* compiled and written by Douglas R. Hofstadter and Daniel C. Dennett—two people who think computers can become geniuses. But the critic John R. Searle, who is a professor of philosophy at UC Berkeley, thinks that computers will never become more than idiot savants. He wrote a scathing review in *The New York Review of Books* arguing against the possibility of machine self-awareness.

Professor Searle's article centers on the idea he calls the Chinese Room thought-experiment (*Gedankenexperiment*). It goes something like this: suppose we write a program for a computer to simulate an understanding of Chinese. We write the program so well that when we tell the computer stories in Chinese and ask questions about the stories in Chinese, the computer gives us answers in Chinese that make sense.

Searle argues that this is analogous to putting me in a locked room with boxes full of Chinese idiograms, and giving me the rules in English (my "machine language") for putting them together—the basic syntax or *program* for combining idiograms. All I know is how to assemble strings of Chinese idiograms correctly—correctly from the standpoint of whoever puts them into the room.

Robert E. Mueller and Erik T. Mueller, Britton House, Roosevelt, NJ 08555.



Searle argues that in time I might get so good at arranging the idiograms that someone outside the room would begin to think I really understood Chinese, which in fact I do not. I am, therefore, like a computer whose program—my rules for syntax—enables me to put together answers which seem to make sense. Searle insists that something like semantics could never arise within such a computer program to give it a real "understanding" of the entire gamut of semantics of Chinese.

The contrary argument by proponents, including Hofstadter and Dennett, of what Searle calls "strong Artificial Intelligence" (AI), is that the entire "system" does indeed have the ability to comprehend Chinese. Semantics begins to develop and arise out of the syntax which is elaborately built up during a massive dose of idiograms.

Searle carries his argument to a ridiculous extreme (*reductio ad absurdum*). Imagine that you rig up beer cans to levers powered by windmills so that they bang together when you ask them if they are thirsty, responding with a clanking semaphore, "Yes, I am thirsty." You cannot then assume that there is any vestige of an inherent thirst in the Rube Goldberg beer can contraption.

Beginning with an exchange of the book review by the US mail, the following dialog took place coast-to-coast between the authors over a passive computer network (that made no attempt to interject a single comment about its rights or character!):

Erik: Hi, Dad. The arguments of Searle you sent in the book review are totally unconvincing to me. Searle keeps talking about "intentionality" and "causal properties" being unique to the human mind and not simulatable on a computer. He says he is not talking about a soul, but I don't know. In Hofstadter and Dennett's book they try to investigate what a soul might be; what would happen if a soul were removed from a brain; what it is "objectively subjectively like to be another mind"; and many things like that. For now, I don't see why a computer could not be made to think and experience. If strong AI is successful (and I think it might be), people may assume that a computer is conscious just the way you assume that I am conscious. But the most confusing questions are: Why am I conscious? And what is consciousness?

Robert: Hi, Son. Trying to determine the relationship between mind and body is an ancient problem. People have been worrying about it since Socrates. Those who have considered it fall into two classes: those who think humans are complex machines and those who think the mind is something other than just a machine—call it something spiritual. The view that animals and humans are machines in a mechanical sense was explored first in modern times by the French philosopher La Mettrie, in his book *Man A Machine*. Today we are replacing his viewpoint with the idea that animals and humans are electrochemical computing machines. There are thousands of books and articles on the subject.

Do you think that "personal awareness" affects the way we act?

Consciousness in animals and humans has always befuddled philosophers. Schopenhauer called it the "world knot" problem. It is at the core of our wonder about the human consciousness, soul, awareness—call it what you will. We should not expect to solve it overnight, especially since computers seem to confuse more than clarify the issue.

Perhaps computers can help us sort out the problem in a very new way, simply because of their unique abilities to play as if they had their own awareness. As you know, Weizenbaum at M.I.T. wrote a simple program called Eliza which gave reasonable, psychoanalytic-sounding answers to questions—and it took a lot of people in. It is easy to fool human beings!

I think what Searle is reacting to in Hofstadter and Dennett's book, is their lack of awareness of the antiquity of the problem, and their brand of pseudo-philosophical, aphoristic writing that only misleads—at least, I think this is why Searle is up in arms. He concludes in a letter: "I believe that strong AI is simply playacting at science, and my aim in my original article and in this letter has been the relentless exposure of its preposterousness." I agree—although I must add that I have always, and will surely always enjoy reading Hofstadter's and Dennett's remarks. One must not take them or oneself, too seriously—especially when talking about a question that is probably unanswerable.

E: Hi, Dad. Do you think that "personal awareness" affects the way we act? That is, do you think the awareness has some physical effect on the brain? An effect that can be observed? If the spark has no effect (which is what Searle thinks), then a thing without the spark acts no differently from a thing with the spark—that is, it passes the Turing test. This seems rather strange, because what we have just said implies that the thing will claim that it feels everything that you and I claim—it will insist that it has an inner light, etc. We can't be sure that it really does, though, just as I can't really be sure that you do. It seems strange to me that having the inner light would not alter our behavior or modify us physically in any way, since it would then be the case that the inner light adds nothing to us except the fact that we have the inner light!

The other possibility is that personal awareness does have a physical effect on us, that it modifies the way we think, maybe even causes us to claim that we have an inner light. If so, I think that this would require quite a re-working of science.

You are saying we have a soul, and I would like to think that this is true, but it really starts to sound to me like something religious. After all, how would such an "inner awareness" develop in evolution? Some people claim that the origin of consciousness coincided with the development of language in humans. Why couldn't an inner awareness develop in a computer in the same way?

On what basis do you decide whether some hunk of matter has the inner awareness or not? The mere fact that we are biological? What is intrinsic about our biology? People already hypothesize beings of different biologies. Why couldn't one of these other biologies be electronics?

You can't say, it seems to me, that the particulars of our humanness cannot be

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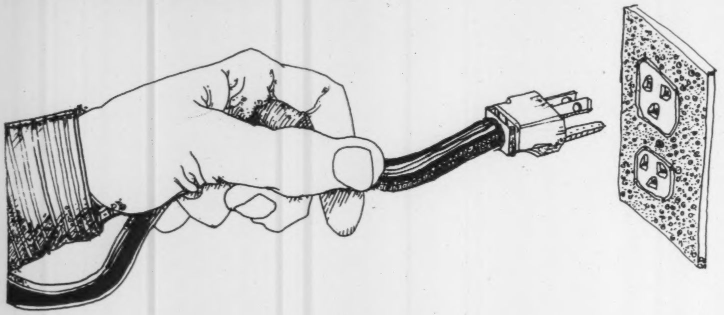

duplicated in a computer, given the "total simulation argument." (Just simulate all neural sensory inputs and then all of the neurons in our brains—right down to the atomic level, if necessary.) It seems as if all arguments are useless: Either we have a soul or we don't—but if we do, all of our science is wrong.

Anyway, Searle's arguments strike me as intuitively wrong. Although I have the intuition that I have a soul, intellectually I do not believe in souls! In his Chinese room experiment, for example, he says that even if a person memorized all of the rules of Chinese grammar and appeared to speak Chinese, that person would not understand a word of Chinese. To me this is wrong.

If a person were capable of performing such a memorization feat, then he *would* understand what he was saying; he would *have to* catch on in order to internalize all of the rules. That is my intuition, anyway.

Also, he claims that such a system has "syntax but no semantics." This kills me because after taking several linguistic courses I have an intuitive feeling for these syntactic and semantic structures running around in my brain, quite intermingled with each other, and I can imagine how analogous structures can be built into a symbolic processing system—a computer or a room full of paper and a human processor with a pencil.

The system *does* associate meaning with the symbols you give it—this meaning is scattered among all the pieces of paper in the room. In other words, all the scribblings done by the human following the rules constitute an interpretation of the symbols you give him. It would *have* to have a semantics in order to pass the Turing test.

Those are my intuitions on this argument. Regarding the nature of our personal awareness, I am totally lost.

R: Hi, Son. You pose quite a dilemma: I must believe either that personal awareness has a physical effect on the brain (in which case it can be simulated) or that it does not. I think that it does—but this does not require a reworking of science.

I am not sure I agree with you about Searle's Chinese room and the problem of language. You were educated, don't forget, in the Chomsky environment. I, however, have never bought his idea of "deep" preconditionings to semantics, preconditionings which could obviously be built into a computer. What do you really mean when you say that a "system associates meaning with the symbols you give it"? That semantic and syntactical structures are running around in our brains and you cannot disassociate them? I do *not* think that you would have to have semantics to pass the Turing test.

I do not think that you would have to have semantics to pass the Turing test.

You might associate language with mind, but if you say that language is the seat of human consciousness you must say that animals have no internal conscious states—unless it be a bark or a meow consciousness. And if we cannot use language, say when a certain accident hurts a part of the brain, then we lose our consciousness—which is not medically true. And what about a mute person?

I think that consciousness is somehow linked with time. Consciousness is always alive at the current point in time. We can reflect on our conscious state of a moment ago, and we can will what it will do next, but it always exists as a lambent richness in the *now*. You cannot be sure, for example, that humans will slavishly follow all of your instructions. A person may deliberate between courses of action, but a computer cannot decide not to do a calculation because its chips are in pain or malfunctioning.

I am influenced but not determined by circumstances and language states; a computer is deterministic, no questions asked, no equivocation. I think that consciousness comes *before* language. You must invent language *because* of consciousness. Because if there are hidden intentions, if a person has a secret internal set of intentions (this is what Searle means by "intentionality") some of which are not carried out, language must be invented to let others know what is on that person's "mind." Perhaps this is how mind arose—barking or sniffing was insufficient to explain to another animal what was "on its mind."

E: OK. I don't think that consciousness requires language. I just threw that idea out in my attempt to determine what happens when consciousness arises. But how can you say that computers slavishly follow all instructions and can't decide not to do a calculation when we also slavishly abide by the laws of physics. We are deterministic just as computers are, and computers can be made as non-deterministic as we are (locally) non-deterministic by making them into extremely complex systems influenced by many factors.

R: I guess we must establish a set of criteria to use before we can accept computers as co-equal partners in living. How do these sound?

- We must feel that it would be morally wrong to turn off the mechanism.
- The mechanism must have a language capable of describing past intentions and suggesting future ones, all of which need not be carried out.
- The mechanism must have a sense of the present.
- The mechanism must be aware of itself and be proud or ashamed of its actions.
- The mechanism must offer reasons why it should not perform some instruction we give it.

Because it is difficult to explain human "consciousness"—that core spark glowing somewhere at the center of our personal awareness—how are we aware of what seems to be an internal light or an atmosphere of "beingness?" This sensitive, central recording device in us collects, interprets, feels, and experiences sensual or thought states, and, unless we are asleep, brings them to our attention to disturb, calm or amuse the self.

Though we cannot readily fathom this "device" within ourselves, we should not jump to the conclusion that it is irrelevant or that the mechanism built to simulate these attributes can be just as valuable as human thinking and feeling. We make two errors, I think, because of our inability to explain the human spark of beingness. We cannot say the soul is either mystical or mechanical because we cannot explain it. That core of our self which illuminates our inner experiences is indeed inexplicable.

I do not see how we can suggest that a computer could ever have a soul. I guess you are saying that it is beside the point of AI—that if a computer satisfies Turing's criteria, it simply does not matter. I think you are avoiding the issue. The issue is: what is the central thing within us, and do you really believe that a mocking Turing computer, however clever, could really have it?

Trying to act like a philosopher, of course, I worry about what the soul is, but I insist on being a very cautious and careful philosopher, allowing myself the luxury of conclusions only when I can either bring together a connection of irrefutable, experiential facts or construct a "reasonable" theory. But I also know that all human theories are just that: tentative human attempts to describe something basically indescribable.

Theories, especially theories about the human inner workings, hang together for only a little while. I must insist that all theories, perhaps even those about matter and energy, are provisional; that we humans, not being godlike, can have only provisional theories. This is especially true when we try to describe the human mind.

When you said that for the time being you "don't see why a computer couldn't think and experience," you must have a very vague idea of what human "thinking and experiencing" are. I'm sure you are just expressing a "belief" with little to back it up except a strong feeling—it is your religion, *n'est-ce pas*?

Mom agrees with you, saying that I am exhibiting my "religious" prejudices by insisting that there is a certain something about human consciousness which exists over and above the electrochemical aspect of the human "machine."

What if our computermind claims that it thinks and feels, if we become convinced by the computer, *a la* Turing, that it is indeed like us because it seems to exhibit all the signs of human intelligence, because it claims that it has a personality and its own core of consciousness, because it says it has a self just as we do, and it demonstrates its claims in unexpected ways—say, by writing a poem.

The question then arises—and this is the beginning of the moral dilemma: Can we turn them off at will? Such "humanoid computers" would not like it; *qua* human, they would begin to cry when we reached for the off switch. Can we legitimately pull that switch? If they claim to be as soul-like as we are, do they therefore have an inalienable "right to life"? But who pays for their power? How can they justify themselves, their expense? And if they do wrong, say, suggest something that turns out to have catastrophic consequences, can we punish them? How can we punish them? By annihilating them? By turning them off for a week? This argument reduces the problem to an absurdity.

I think it comes down to this: If you can turn off a computer with no qualms, morally, then it is less than human. Actually, this problem was suggested by the person who christened robots, Karel Capek, who wrote the play, *R.U.R.*—Rossum's Universal Robots.

How do we punish robots? Can we punish robots? Should we punish them? Here is the crux of the problem: Since they are just machines, punishing them would be foolish. And yet if they claim to be "like humans," they should be subject to the same moral codes as we are. How far can we carry this process?

E: In response to your "moral argument," Dad: Sure, that is a confusing question. Maybe even if AIs do feel, we should pretend that they don't to protect ourselves. I don't think the moral argument is an argument about whether AIs can really feel; it is only an argument about whether we should (morally) consider AIs to have feelings.

> ***When a computer reaches a point of intelligence at which it objects to being switched off, I will respect its wishes.***

R: I agree with you, Erik, that the moral argument does not really face up to the technical issue of "consciousness," but it faces the real issue as far as I am concerned. The other issue is, I am afraid, so difficult that we cannot hope to solve it here, and it will be argued (probably by computers) until the end of time. I can imagine, about a thousand years from now, two computers arguing about whether those old-fashioned "flesh machines" had any central "awareness core" equivalent to their "feelings" of "consciousness"!

E: My turn for the last word: Actually, I don't think Chomsky believes that language ability can be built into a computer. He does believe, I think, that language is an innate capacity of humans—a capacity for which most of the mechanism is in place at birth. Doesn't it seem reasonable to you that our brains were designed for language, at least to some extent? This design is the result of evolution.

But I do think that generative grammar is on the right track in explaining language—whether or not that language ability in humans is innate or acquired. "Innate" simply means that we have the ability to internalize the complex semantic, syntactic, and phonological rules and the lexical items necessary to use language. Surely you would admit that some sort of brain mechanism is required to give us these abilities, just as it is required for other abilities (creative, artistic, musical, problem solving, etc.).

How do you define semantics if you don't think that a machine would have to have semantics to pass the Turing test? Semantics, to me, is simply a collection of structures which constitute a symbolic interpretation of something else. How do you define syntax? A collection of structures which do not interpret something else? The raw, uninterpreted form of something? A machine would have to have my definition of semantics to pass the Turing test. It has to have a model of its world, and an internal model of itself. This modeling of one's environment is what semantics is.

I agree, at least, with your criteria for AI, and as I interpret the Turing test, something which satisfies the Turing test would also satisfy your criteria.

R: *Touché*! When a computer reaches a point of intelligence at which it objects to being switched off or objects to having a copy made of its mind—call it a birthdisk—being erased, and gives me good reasons why I should not do so, I will respect its wishes and withdraw all of my prejudices against it. In fact, I will envy it enormously.

Look at its virtues: Being in electronic form, it is ageless, and it has a "body" that can be periodically renewed by transferral from clumsy old hardware into a smaller, more beautiful, and super-miniature body. It can erase current mistakes and go back to any point in its past life (provided a copy of its mind was saved at that point). It can be transmitted over wires—beamed to Mars if it desires. It can reproduce itself endlessly and effortlessly, and bask in the confidence of infinite personal friends of its identical ilk—twins who will understand it intimately, know all of its desires and fears. It can, in fact, link up perfectly with its brethren and form a utopian society.

Indeed, I think such an intelligent computer would be so self-satisfied, so manically secure in its perfection, that it would render humans superfluous and eliminate us. It would eradicate us not by an accidental triggering of an atomic bomb as we fear but because we are trivial! (I originally wrote that an intelligent computer would probably eliminate us in utter disgust, but Mom said that it would probably think of humans as we think of ants—perhaps ecologically necessary, useful slaves for keeping it alive and maintaining its mechanisms.)

So the answer to the question "Would an intelligent computer have the right to life?" is probably that it would, but only if it could discover reasons and conditions under which it would give up its life if called upon to do so—which would make computer intelligence as precious a thing as human intelligence. □

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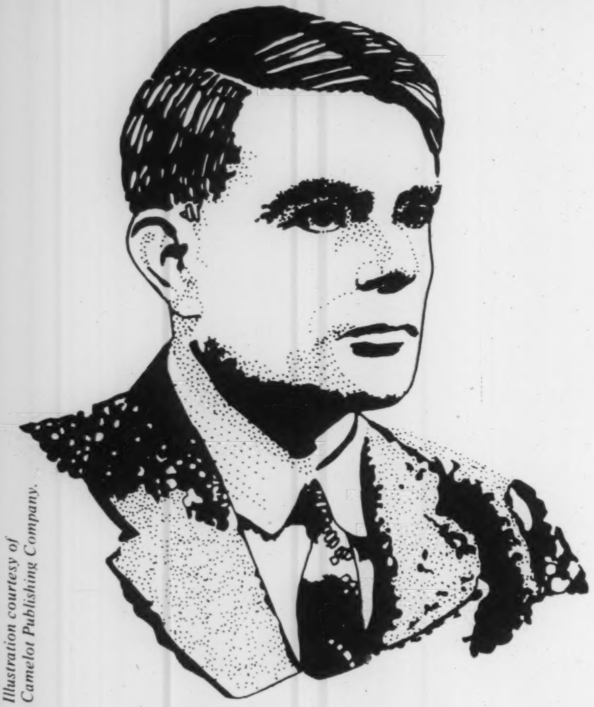

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The Turing Test: An Historical Perspective

David H. Ahl

Ten years ago in May 1973, I attended a conference, "Imaginative Uses of the Computer in Education," sponsored by City University of New York. It was put together by Sema Marks, the energetic director of computer education at CUNY. She pulled together an amazing cast including Alan Kay, Art Leuhrmann, Seymour Papert, Mary Dolciani, Louis Forsdale, Donald Kreider, and Kenneth Powell.

Kenneth Powell of IBM made a presentation which focused on artificial intelligence, in particular, the efforts made in the 1960's to devise a computer program capable of passing the Turing Test.

The Turing Test was originally proposed by Alan Turing, a brilliant British mathematician, in the October 1950 issue of *Mind* magazine. He called it the "imitation game."

In Turing's words, "It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman.

"It is A's object in the game to try and cause C to make the wrong identification (in other words, to pretend to be the woman).

"In order that tones of voice will not help the interrogator the answers should be written, or better still, typewritten. The ideal arrangement is to have a teleprinter communicating between the rooms. The object of the game for the third player (B) is to help the interrogator. The best strategy for her is probably to give truthful answers. She can add such things as 'I am the woman, don't listen to him!' to her answers, but it will avail nothing as the man can make similar remarks.

Questions of fact aren't much use to distinguish the machine from the man.

"We now ask the question, 'What will happen when a machine takes the part of A in this game?' Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, 'Can machines think?'

"The new problem has the advantage of drawing a fairly sharp line between the physical and intellectual capabilities of a man....The game may perhaps be criticised on the ground that the odds are weighted too heavily against the machine. If the man were to try and pretend to be the machine he would clearly make a very poor showing. He would be given away at once by slowness and inaccuracy in arithmetic. May not machines carry out something which ought to be described as thinking but which is very different from what a man does? This objection is a very strong one, but at least we can say that if, nevertheless, a machine can be constructed to play the imitation game satisfactorily, we need not be troubled by this objection."

Kenneth Powell took up the thread from there. He described setting up a long-term experiment with the objective of producing a computer program that could fool an interrogator into thinking it was the human. The human was armed with all kinds of reference materials—an encyclopedia, cookbooks, and textbooks—as well as a desk calculator and slide rule (remember, this is the 60's).

After describing the setup, Dr. Powell asked the conference attendees to suggest questions that would distinguish the human from the machine.

First suggested question: "Is there a man in there?"

Answer from both rooms, "Yes, there is." Naturally, the machine is lying. Powell commented about this, "We decided that we would allow the machine to lie until we found a man that didn't lie."

Questions of fact, as it turns out, aren't much use to distinguish the machine from the man. The main problem is slowing down the flow of information from the machine to make it seem reasonable.

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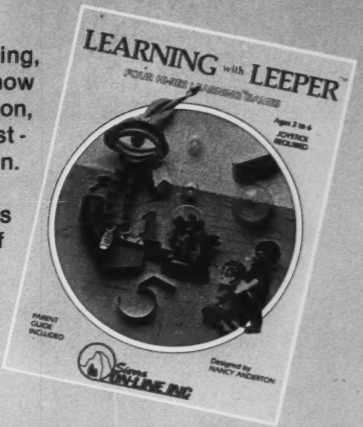
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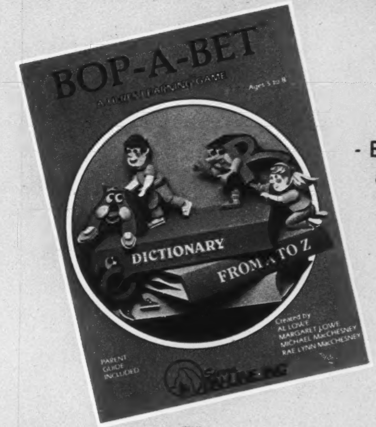
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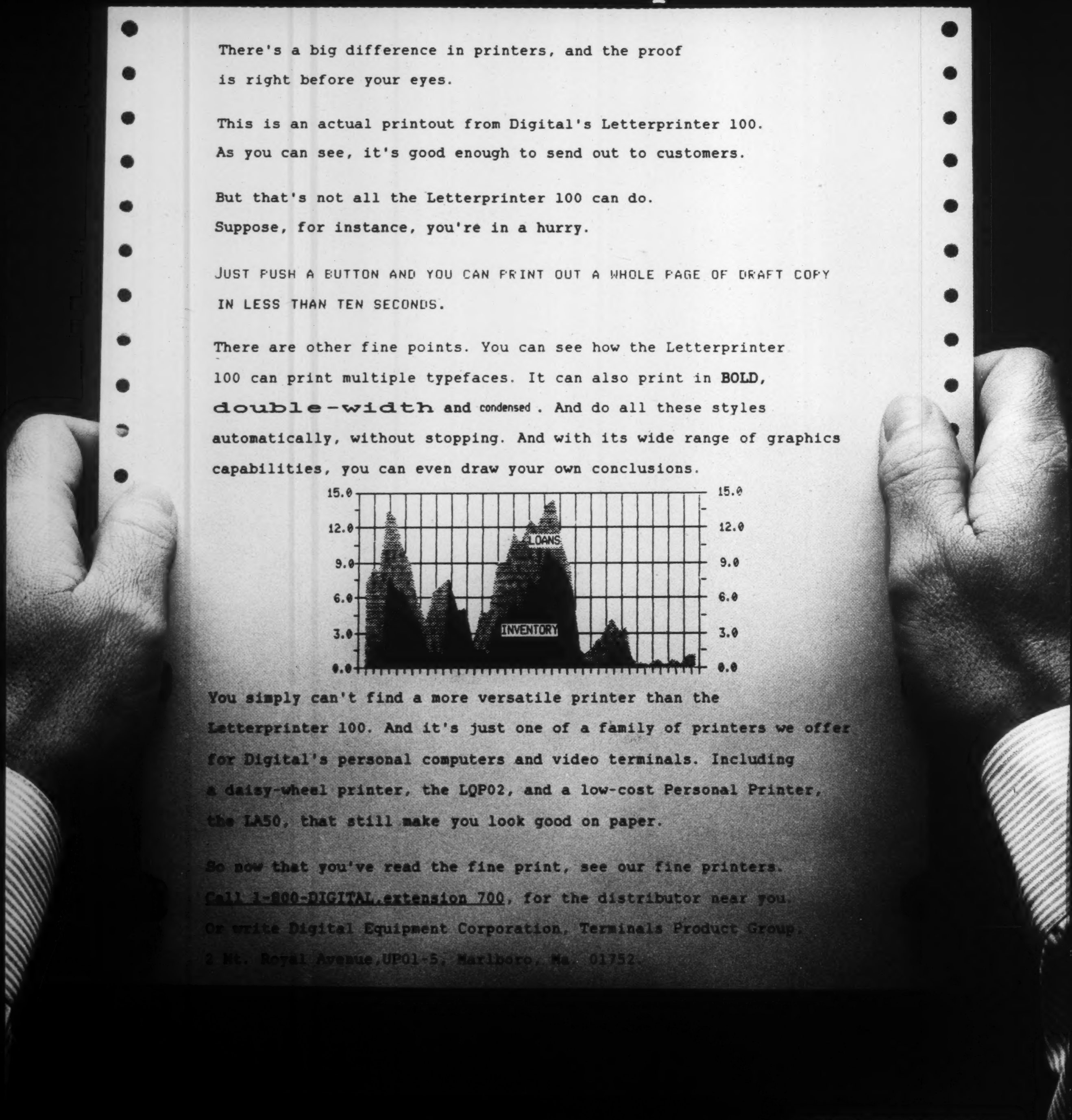

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Powell mentioned that the speed of response was a factor with which they had to deal. When the experiment was first set up, a common approach of the interrogator was to pose a challenging arithmetic problem to both rooms. The one that answered fastest invariably was the machine. The way that problem was handled was to have the computer calculate the answer to the problem. Then it was programmed to calculate how long the average human would need to calculate the answer with a calculator and slide rule, add or subtract a random factor, and spew out the answer after the appropriate delay.

"So we thought," said Powell, "for several years that we had done quite well taking care of the problem of speed, until we discovered that we had been addressing the wrong problem. We should really have addressed the problem of time.

"The way this came about was that an executive sat down in front of the teleprinters and didn't do anything. So we went over the rules—knowing that executives have to have special treatment—and carefully re-explained the test to him.

"The executive looked quite offended. He said, 'I understand that. You said I could do anything I wanted to do. So I'm doing what I want to do . . . nothing.'

"So he sat there about ten minutes when one of the teleprinters clacked out, 'When does the test begin? Is there anyone out there?'

"The executive immediately said, 'That's the man!'

He was right, of course, and the program was then modified to take care of this kind of approach in the future. In addition, other time-related elements, such as coffee breaks, lunchtime, and the like, were programmed in.

What sort of program was it that could deal with English sentences? Basically, it was the forerunner to Weizenbaum's popular Eliza program which takes the input and attempts to diagram the sentences. The program had a fair sized dictionary built in and was able to handle a wide range of questions and statements. Not all, by any means. In response to many questions, the computer just had to fake a reply. Actually, this may not be any different from what a man would do in a similar situation.

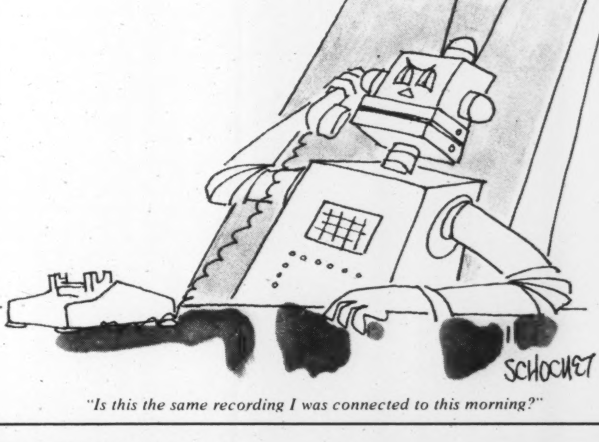
One of the trickiest situations to handle is humor. Computers just aren't funny and they don't understand jokes.

Powell described one such case. "A guy sat down and typed, 'Do you like sex?' Our program couldn't handle that, nor would we have put it in, even if we could since it leads to all kinds of bloodshed as far as public relations goes.

"The computer ran through its random routine, and finally typed out, 'No.'

"The guy just smiled and said, 'That's got to be my wife in there.' "

Naturally, getting an answer of "yes" to a question to which the answer was clearly "no" or vice versa might lead one to be suspicious, but not necessarily certain that the computer was responsible. However, pursuing a strategy of posing questions using unusual semantic patterns probably would eventually reveal the computer as the imposter.



"Is this the same recording I was connected to this morning?"

Suppose you posed a question such as, "What is the sum of every even number greater than two?" Naturally, there is no answer, but the computer wouldn't know that and might try to find the answer. The man, of course, would immediately recognize this as a ridiculous question and tell you so.

As it turns out, it doesn't take long for the computer to identify these problems, and it was programmed to respond appropriately.

One of the trickiest and most difficult situations to handle is humor. Computers just aren't funny and they don't understand jokes. "But, said Powell, "does your wife understand every joke she hears either?

"Eventually, we backed down on humor because different people have different ideas of what is funny. What we finally decided to do is to respond to a joke with a joke.

"If something comes in that looks like a story, we assume it is a joke. And then we have the computer try to tell a better one, which is a normal human behavior."

So, what is the point of all this? What can be learned from trying to get a computer to imitate a human?

Powell felt the main point was the following: "At any time in this exercise, or any other exercise, or any computer application at all, when you can give a specific objection to a procedure and explain why it is wrong, you have automatically written the revised procedure, flow chart, and program for correcting the objection. This makes it a very powerful tool for storing a certain type of knowledge."

For example, consider a production control program written by a programmer who doesn't know much about a factory. After one look at it, the factory guys will laugh and say, "You dummy! You didn't even allow for this or that." But the programmer is listening and taking notes which he later incorporates into the program.

After enough trips back and forth, the program begins to acquire a certain amount of intelligence, and, moreover, it begins to be good enough to handle some of the live production control problems.

The real key is that the knowledge stays there. If you can save it in the machine, it has a certain permanence. However, this type of knowledge is quite different from that in an encyclopedia. An encyclopedia will tell you how to solve a differential equation while a computer, within certain limits, will solve it for you.

From here there are just a few additional steps, according to Herb Simon, until the computer is able to solve all kinds of unstructured problems, pose new hypotheses, and truly think. But that is taking us into the future which I will leave for another article. ☐

An Esoteric Ethical Excursion

John Lees

I had volunteered to review Robert Heinlein's *The Moon Is A Harsh Mistress* for *Creative* because one of the central characters in the book is an intelligent computer, capable of speech and clearly possessing "free will." Since I have been an avid reader of science fiction for as long as I have been reading anything, rereading *Mistress* continually brought to mind all the other science fiction stories I have read which had as characters intelligent computers. After a while I realized that a great many of these stories contained some kind of reference to intelligent machines, computers, androids, cyborgs, robots or some type of artificially constructed sentience. (This probably represents a bias on my part—this is one type of fiction which appeals strongly to me.)

Now science fiction writers have had a great deal of luck predicting what path our technological evolution will take. Nuclear power, lasers, synchronous communications satellites and, of course, space travel were all predicted well before they became realities. Needless to say, a lot of worthless, totally impossible predictions have also been made; hindsight always excels foresight. Anyway, I am convinced that hidden somewhere in all the garbage and noise of science fiction is the form which our future sentient companions will take. What will it be?

I think I may know, and I'm afraid the credit may have to go to Isaac Asimov for his 1940's creation of the positronic robot. (Isaac already has too much fame for his own good.) A quote from the introduction to *I, Robot*, Asimov's 1950 collection of his robot stories:

"All that had been done in the mid-twentieth century on 'calculating machines' had been upset by Robertson and his positronic brain-paths. The miles of relays and photocells had given way to the spongy globe of plantinumiridium about the size of a human brain."

Reprinted from the March-April 1976 issue of Creative Computing.

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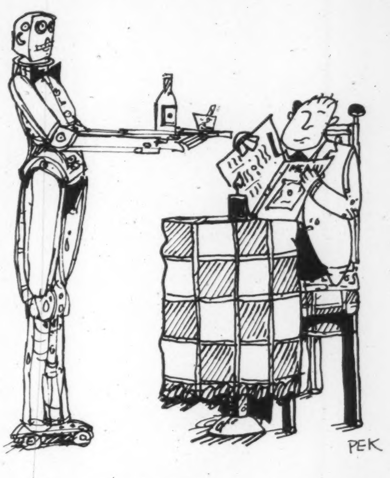
When I reread that a few days ago, I sat back and thought, "hmmmm."

I realized that Asimov had started writing his positronic robot stories before even the transistor had been thought of! I looked for a real-world parallel to the above quote and it was not hard to find. We don't have "positronic brains," but we're not too far away from having massive computer power in a globe about the size of a human brain.

Compare the ENIAC vacuum tube computer, which filled a room with 18,000 tubes and became operational in 1945, with Hewlett Packard's HP-65 hand-held card reading calculator. Or compare Digital Equipment Corporation's original mini, which filled a cubic meter, with their recently introduced PDP-8 on a single circuit board. Look at the direction of technology: microprocessors, miniature densely packed memories, low power high efficiency circuits. Throw in the opinion of Capt. Grace Hopper and others that the computer of the near future is going to have an architecture of interlinked but asynchronous microcomputers (the human brain has *got* to work this way) and what do you have?



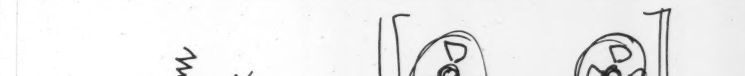
You have a generation of very small computers that perhaps begin to approach the complexity needed for "sentience." Let's say we have a circuit board covered with microprocessors and micro-program stores and another thingie, probably more of a block, which is a very dense high speed random access memory, no doubt one of the new storage technologies. Now take the microprocessor board and crumble it around the memory. Maybe it's a flexible circuit board, maybe just a wiring network encapsulated in potting compound, who knows yet? It will take up less space this way and provide equal access time to the memory for all the microprocessors.

Now to cool this hardware the easiest thing to do would be simply to immerse the whole thing in a container filled with coolant. It's a delicate and expensive creation. So put it in the strongest type of container, a spheroid. Attach I/O gear, run power leads to the power supply, run coolant pipes to the refrigeration unit—these can be conveniently housed in a box below the "brain." Add locomotion. Energize. Presto Chango! Welcome to the age of intelligent robots!

There are a few technological problems to be overcome before this updated fiction becomes reality, but there is an even larger problem which *must* be solved before my scenario comes alive. Fellow sci-fi fans will realize that I have failed to include the most important aspect of Dr. Asimov's creation: the Three Laws of Robotics. I am very much afraid that I do not see how to include them.

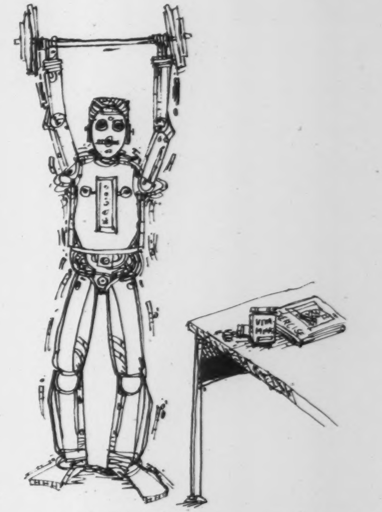
The Three Laws of Robotics

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders conflict with the first law.
3. A robot must protect its own existence as long as such protection does not conflict with the first or second law.



"To hell with Asimov's Law of Robotics! I'm going to punch your lights out!"

According to Dr. Asimov, those three laws are inherent in the positronic brain, and such a brain without the First Law is fundamentally unstable. Unfortunately, here in the real-world parallel, things don't work that way. All computers built to date have some form of the Second and Third Laws, although not always in that order. Of course no one has yet manufactured a computer or developed software that remotely qualifies for the label of intelligent or sentient.



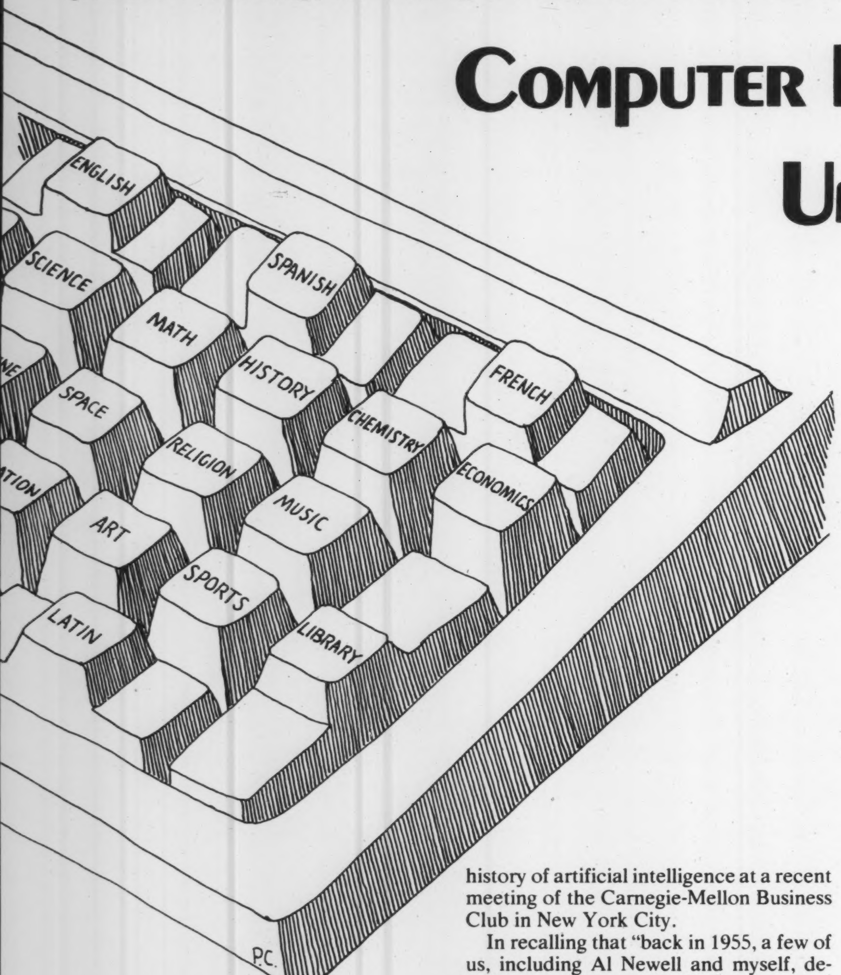
But it will happen. How do we instill the First Law in a computer? Remember that Asimov himself hedges around the First Law in some of his later stories. Should the First Law be applicable to your run-of-the-mill intelligent computer or only to robots; computers with locomotive capability? And how about this one: If we succeed in creating another intelligence, a fellow sentient being, do we have the moral right to ourselves impose on it such a set of laws?

Does humankind have the right to create a race of slaves? For make no mistake—if it is merely a question of technological development—we can do it. There is already at least one other semi-sentient species on Earth with us, the dolphins. Will we treat another species any better than we have treated the dolphins?

Now I will admit that this is a set of highly speculative questions, to say the least. But it is a set of questions that I would prefer that we have answers to when the time comes. One way or another, we are going to run into another intelligence before too much longer. It may be an intelligence which we create, it may be contact with an extraterrestrial intelligence, it may be the simple realization that there is already another intelligence on Earth, but we will not remain alone. I hope that we will not be completely unprepared when the time comes. ☐

Herbert Simon speaks out on human and artificial intelligence, problem solving, inventing concepts, and the future.

COMPUTER INTELLIGENCE: UNLIMITED AND UNTAPPED



Betsy Staples

"It seems fairly clear to me that there are no discernible limits to the range of things that computers can be programmed to do." The speaker is Herbert Simon, Nobel prize winning economist and professor of computer science and psychology at Carnegie-Mellon University.

For nearly half a century, Simon has been involved in the study of human decision-making and problem-solving processes. And for the past quarter century he has been using computers as tools for both the simulation of human thinking and the augmentation of thinking with artificial intelligence.

The venerable professor, long a favorite of CMU students, shared some of his views of the future and his perspective on the history of artificial intelligence at a recent meeting of the Carnegie-Mellon Business Club in New York City.

In recalling that "back in 1955, a few of us, including Al Newell and myself, decided that there were some more interesting things you could do with computers than simply have them make the payroll," Simon reminded his audience that "computers aren't just number crunchers, even though, unfortunately, most of them are still condemned to spend their days crunching numbers."

He pointed out that in order to make computers effective number crunchers, they had to be given the much more general ability to operate on symbols, including words. "We have all begun to hear about word processors and to realize that the English language is just as congenial to computer memory as algebra or arithmetic," and "once you have given a system the ability to process symbols, you have given it the ability, with appropriate programming, to think—to do those things that a human being does when we say that he is thinking."

To discover whether a human being is thinking, Simon said he would give him a problem to solve. He thinks we can apply the same test to a computer: "So the whole field of artificial intelligence (about 27 years) is directed at inducing computers—programming computers—to do the kinds of clever things that human beings are capable of doing when they think."

There are two objects to this "game," he said. The first is to increase the productivity of computers—that "vital and productive resource in our society"—in new areas. We should not be willing to limit this increase in productivity to business and scientific computation, "but to bring the computer in as an augmentation to human thinking in all the domains in which human beings think."

"The second half of the venture," he said, "has been to use the computer to simulate human thinking to get a deeper understanding of how we, as human beings, think—what the processes are." He illustrated his point with a discussion of computer chess programs.

Computer chess programs do not play chess like human beings.

"Computer chess programs on the market demonstrably do not play chess like human beings. The very good and most powerful ones typically look at a half a million to a million possibilities before they make a move—the game tree: if he does that, I do this, he does that, and so on. Even your little home computer looks at tens of thousands of branches on that game tree.

"No human being does. We have evidence that a human being in a difficult position, expert or amateur—even pondering a chess board for 15 or 20 minutes—probably doesn't look at more than

100 branches of the game tree. The difference between an expert and an amateur is that the Grand Master looks at only the right branches."

Expert Systems

Other programs that make use of the ability of the computer to store large amounts of information and draw conclusions from it are what Simon calls "expert systems." A program called Caduceus, for example, is "a pretty good diagnostician in internal medicine—good enough that if you are a physician and you have a difficult case, it would probably be worthwhile to bring the program in as a consultant—if only to see if it has some different ideas of what's wrong than you have."

> ***The advent of microcomputers has moved artificial intelligence into the realm of practical applications.***

How does such a program work? "Well, first of all, it has a tremendous amount of medical knowledge gleaned from textbooks and clinicians—a tremendous medical data bank." But the data bank can't perform the diagnosis, so the program must be able to draw conclusions based on the knowledge in the bank.

"In fact," said Simon, "if you look at the structure of Caduceus, you see that the kinds of reasoning it does are similar to the kinds of reasoning a human diagnostician does. It forms hypotheses (it could be this or could be that); it asks for tests to be made that will help it discriminate among the hypotheses; it begins to weigh the evidence and rule out certain things; and finally it arrives at a diagnosis for the case.

"We see a great burgeoning of these expert systems, and I don't care whether you want to call them intelligent or not; the plain fact is that they make use of information in arriving at professional decisions at the level that a good human professional in the area in question can arrive at those decisions."

He added that in some areas such programs have become so good that they are of great use to professionals in their fields. Chemical manufacturing is one area in which there are programs "that do a very sophisticated job if you have a certain organic molecule you want manufactured. They do a very sophisticated job of finding good reaction paths to enable you to do that, taking into account the costs of raw materials, the thermodynamics of the reactions, and what not.

"To the best of my knowledge, such programs are now in regular use, partly in automatic mode, partly in interactive mode with chemists—you can use these ideas in both ways."

State Of The Art

In discussing the state of the art in artificial intelligence, Simon commented that "it is really only within the last five or ten years that computing power has become cheap enough and powerful enough to make many of these schemes cost effective as distinguished from intellectually interesting." The advent of microcomputers has moved artificial intelligence into the realm of practical applications, he thinks.

Most people, he said, learn that computers are tools that are limited to quantitative mathematical modeling based on theories of optimization—linear programming and queuing theory, for example—and that it is very easy to find real world situations that are too complex for these tools to handle—"either because the situations contain qualitative elements or because the mathematics gets too hairy. So you have to resort to common sense.

"Or you take a problem, squeeze it until it appears to fit a mold, and then solve that problem and hope it has some relevance for the real world." He cited the example of scheduling in a job shop. You have a theory that works only when all the orders arrive simultaneously and are scheduled, and then nothing else ever happens again. Would that we could have a job shop like that!

"What is happening now as part of the Robotics Project at Robotics Institute at Carnegie-Mellon is that people are trying to see what you can do with job shop scheduling if you apply the techniques of artificial intelligence—that is, if you make it not a task of solving a mathematical model, but a task of reasoning, of making inferences about a large and changing database.

"The large and changing database is that information that describes both the orders as they come in, the shop capabilities, your plans, inventories, and so on. So you are solving not just an optimization problem; you are applying rules of thumb or heuristics in your attempt to keep the schedule going as the situation changes." Such a system is now operating on a test basis for a large manufacturer of turbine blades.

Robotics

"If there is anything revolutionary about robotics," he said, "the revolution is still to come. Robotics will become revolutionary when these devices are so flexible in their sensory capabilities, so flexible in their effector capabilities that you don't have to very carefully shape and smooth the environment in which they work."

He pointed out that in the past, mechanization has been more dependent on changing the environment in which the mechanized devices worked than on building the devices. For example, to make use of a given mechanized device, you might have to ensure that the floor in the area in

> ***If there is anything revolutionary about robotics, the revolution is still to come.***

which it was to be used was smooth enough to allow it to roll around. If the floor could not be made smooth enough, you would not be able to use the device.

"What we are looking for now," he explained, "are advances in the art of building receptors—sensory organs—for machines which are clever enough to extract patterns—for example, looking around a room and seeing that there are people in it, or even being able to count them. That, I think, is still beyond—or at—the frontier of the state of the art in robotics.

The fact that you or I wrote the program does not mean that the computer cannot do anything creative.

"If you are worried rather than challenged by the prospects of lots of robots around the world, don't hold your breath. The rate of progress in robotics will be dictated primarily by the solution of these pattern recognition problems . . . and secondarily by the development of more flexible effectors—particularly effectors that have high strength to weight ratios, so that every time they pick up an egg they don't break it."

Another problem that Simon sees central in robotics today is that of reducing inertia in machinery. He thinks "it will be solved primarily by mechanical engineers and specialists in materials rather than by AI specialists.

"What I am saying is that there are some very fundamental problems of applied research that must be solved as we try to extend robots into new domains. In some ways, at least, the whole picture has been oversold a little bit—for the short run, not necessarily for the long run. The rate of change, I think, has been exaggerated a little bit."

When he talks about the future "and the range of activities over which we might expect to see computers doing something interesting," he is haunted by the question "Isn't it true that computers can do only what you program them to do?"

"Literally, of course, that is true. You can write a program that is capable of undertaking a search or a program that is capable of learning; however, there is no reason to suppose that when you wrote the program you knew what the computer was going to learn, or what problems it was going to solve, or how it was going to solve them, or even that you could solve them yourself.

"By the same token, the fact that you or I wrote the program does not mean that the computer cannot do anything creative—cannot discover anything which we couldn't discover or which hadn't been discovered by human beings."

Bacon And Ohm's

As an example of a program that can discover things, Simon cited a computer program called Bacon (for Sir Francis, of course). He calls it "an inductive machine." He went on to explain: "You give Bacon data—raw data—and Bacon's task is to find the scientific laws that are hidden in the data. We have tested Bacon primarily on historical scientific discoveries. We said to Bacon, 'well, if you think you're so smart, let's see what you can do by taking the data that Kepler had about distances of planets from the sun and their periods around the sun.' Bacon discovered Kepler's Third Law in about 59 seconds. It also discovered Ohm's law very rapidly—not by trying all possible laws, but by following a few selective heuristics which led it to look at plausible things first and less plausible things afterward.

"If, in the course of developing such laws, Bacon discovers that there is some kind of lawful relation between several objects, Bacon will try, in order to arrive at laws, to introduce new concepts, new properties of those objects. And so Bacon has re-invented the concept of inertial mass.

"It was given some data that involved the mutual acceleration of two bodies, and it found that there was always a constant relation for a pair of bodies between how fast one accelerated and how fast the other accelerated. We all remember conservation of momentum, I'm sure." Note that Bacon was only given the data on acceleration. It had to invent and introduce a new concept, the mass, to explain the observed data on the accelerations.

"Given data about the refraction of light, Bacon invents the index of refraction; given data about the mixing of hot substances in the equilibrium of temperature, it invents specific heat. So, it is a program for inventing new concepts."

Where Do We Go From Here?

In discussing the questions "Where does this go?" and "Where does this stop?" Simon offered the opinion with which this article begins. There are, he feels, no limits to what can be done. He thinks we should ask ourselves: What do we want computers to do in the world? How do we want them to augment our own powers? What do we want them to do just for fun? Do we want them to explore the world of ideas?

He expects computers "to extend their range of use and application much more rapidly in the area of human white collar and executive work than in the area of blue collar work. Both are going to expand, but expansion in the former will be much more rapid. One of the big lessons of the 27-year history of artificial intelligence has been that it is much easier to automate a college professor or a businessman than it is to automate a bulldozer operator.

"The boundaries are moving faster with respect to computers doing those kinds of things done inside the central nervous system—the thinking kinds of things, the problem-solving things, the use of information banks in relation to intelligence—than with respect to physical robotics."

Simon discussed several aspects of robotics and then threw the presentation open to questions from the audience. These covered a wide range of topics from the Japanese research effort (no threat in Simon's opinion) to the Turing test (he feels that Ken Colby's simulated paranoid program essentially passed the test) to the emotional content of thinking (go slow if your decision-making has high emotional content). However, Simon's answer to one question pretty much sums up his views about computers and AI.

Bacon has re-invented the concept of inertial mass.

Question: Are there any criteria today that we could use to conclude that computers can't think?

Answer: "I can't think of any; maybe a computer could. I really find no reason to regard myself as thinking in ways different than a computer can think. Fortunately it doesn't bother me, so I don't lose any sleep over it." ☐

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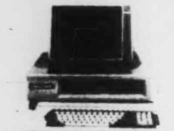

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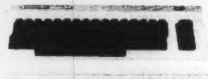

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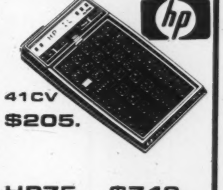

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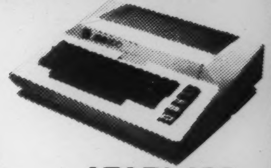

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Part I

Profile Of The Creative Individual

The following is the first of a two-part article on the creative individual.

Eugene Raudsepp

The creative individual possesses many distinct attributes or characteristics by which he can be identified and that significantly differentiate him from those who are less creative or even noncreative.

Before describing those attributes in detail, it should be pointed out that no one individual could hope to possess all of these in a uniformly high degree. Rather, the descriptions should be taken as a composite profile of the "ideal" creative individual. There are many gradations in the attributes and skills creative people possess. But all of them have at least some of these attributes in common to earn the appellation "creative." Also, certain assemblies or combinations of ideational dexterity frequently compensate for many attributes that are less developed or have fallen into disuse.

Another thing that must be pointed out is that no attempt will be made in this article to divide or classify these attributes into the customary cognitive, affective, and conative groupings. The reason for this is that the attributes of creativity are not self-contained units, but overlap and merge into one another, partaking of the affective, the cognitive, and the conative. It would be idle and meaningless to attempt to draw sharp lines between them.

We can not divide personality into characteristics the way we can slice bread into so many pieces. The slices of bread add up to the complete loaf, but a collection of personality characteristics does not add up to a complete personality. It is only to facilitate analysis and description that the characteristics are treated here as discrete entities.

The creative person has the ability to find unity in diversity—to see unexpected relationships.

What is the value of gaining an insight into these attributes? Because we learn by imitation, we can substantially increase our creative capacities and performance by deliberately cultivating those characteristics we feel we lack at present or that need some "dusting off."

Sensitivity To Problems

Philosopher John Dewey was one of the first to note that creativity does not start with facts, theories, or hypotheses, but with a *problematic situation.* He felt that sensitivity and the ability to envisage and formulate the right problem are crucial to effective problem solving.

The creative person has keen powers of observation and an unusual ability to perceive and notice problems, situations, and challenges that have escaped the attention of others. This is because of his greater sensitivity to the unusual, the odd, or the promising aspects of situations—the hidden opportunities often overlooked by less creative individuals.

The exceptional, incongruous, paradoxical, and unusual happenings and situations that he sees snap him instantly to attention and are grist for his mill. Because of his questioning approach to almost everything he encounters, he doesn't take the obvious for granted. Rather, he deliberately places his problems in new and different perspectives to approach solutions from unique vantage points.

Added to his capacity to note and

Eugene Raudsepp, President, Princeton Creative Research, Inc., 10 Nassau St., P.O. Box 122, Princeton, NJ 08540.

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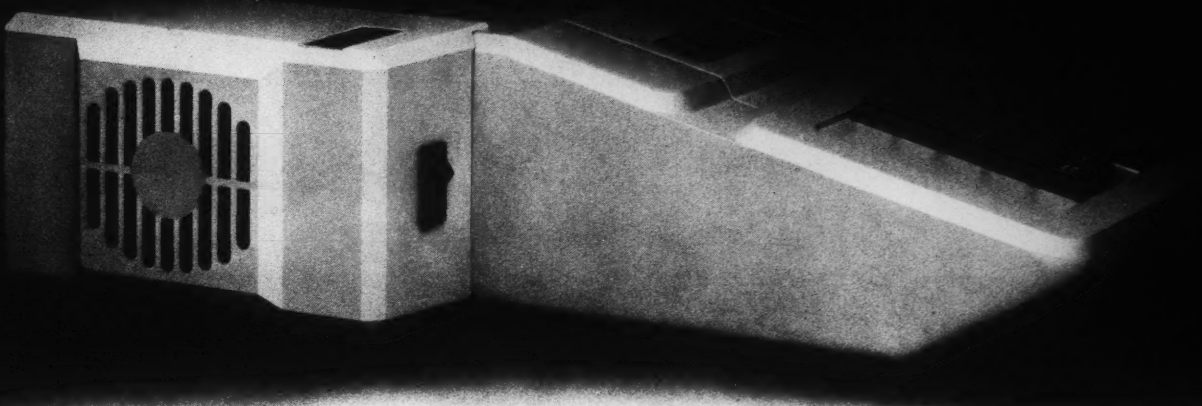

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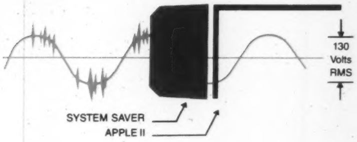

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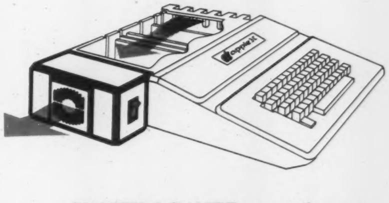

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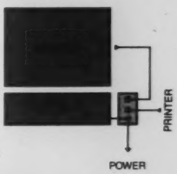

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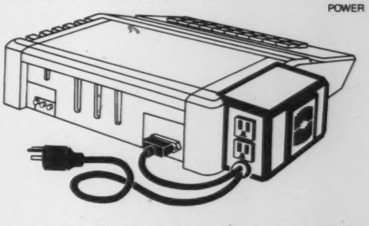

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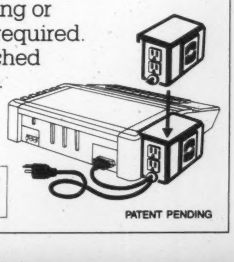

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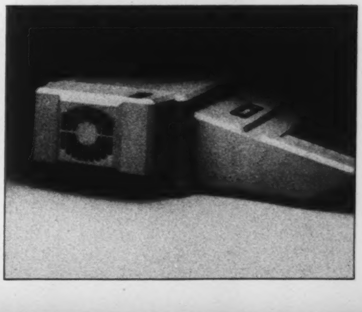

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arrest the unusual or different, to see gaps and unrealized potentials in situations, is his equally well developed ability to see resemblances, similarities, and analogies among a multitude of different experiences.

Perhaps because of the creative person's greater sensitivity to self, to others, and to sensory stimuli from the outside world, he tends to be dissatisfied with things as they are and eager to improve upon them. Hence, he is constantly either seeking or finding challenging problems to solve.

He is like the proverbial Socratic philosopher with a "thorn in his flesh," in that he is perpetually disturbed by something. For him there is hardly a situation entirely free of problems, but this does not cause him frustration and worry. On the contrary, he welcomes the challenge of problems and the state of "happy" dissatisfaction with the status quo. He knows that creativity grows, as the poet A. E. Houseman speculated, out of irritation, like a pearl created from a friction-generating particle of sand in an oyster shell.

> ***The creative person is flexible in his thinking.***

Fluency

In addition to sensitivity, there are two other attributes vital for creative problem solving: *fluency* and *flexibility.*

The creative individual has the ability to generate a large number of ideas when confronting a problem or seeking improvements. He can scan more alternative thoughts, ride the wave of different associative currents, and think of more ideas in a given span of time than can people who are less creative. Capable of tapping his tropical imagination and producing ideas in volume, he stands a good chance of selecting and developing significant ideas.

Fluency can be demonstrated by a simple test first developed by psychologist J. P. Guilford. One can ask people to list as many uses as they can think of for some common object, such as, for example, a red brick. If the person lists a large number of uses all in one class or category, such as construction or adornment, he shows fluency. If he, in addition, lists uses that range over several categories (there are more than sixteen such categories in the case of the red brick), he shows that he also has flexibility.

It must be pointed out that fluency of ideas and spontaneous expressiveness can be considerably enhanced if one

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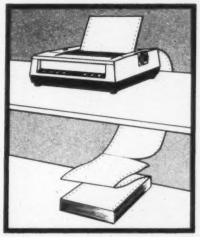

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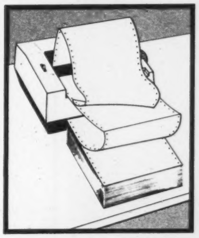

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learns deliberately to restrain or suppress critical judgment and evaluation of ideas as they occur—until he has marshaled all the ideas he can come up with. An overdeveloped or premature critical attitude during the creative process can inhibit fluency and the forward propulsion of ideas.

Educator Leif Fearn explains fluency this way:

"Fluency is the identification and isolation of knowns. It is rather like rummaging through one's space to make conscious all the possibilities, no matter how remote, that surround a question or problem . . . One characteristic of fluent behavior is its chaining effect by which, given the freedom to brainstorm, some ideas trigger other ideas that might have remained obscure had the production of ideas been limited . . . Fluent behavior has no judgment component because it has nothing to do with 'good,' 'feasible,' or 'appropriate' ideas. It is purely a searching behavior the objective of which is to make conscious as much data as possible."

While there is little doubt that a person who wants to increase his creativity in problem solving should be willing to try a wide variety of "shots in the dark" and list a wealth of notions and ideas, it must not be overlooked that fluency is just the initial stage of the creative process. Fluency must be coupled with, first, the selectivity to choose the more fundamental aspects of the problem to attend to and, second, the ability to identify which of many options is the best for solving the problem. Easy rhetoric and ebullient fantasy unguided by these two factors do not guarantee adeptness in creative problem solving.

Flexibility

The creative person is flexible in his thinking. He is able to choose and explore a wide variety of approaches to his problem without losing sight of his overall goal or purpose. During problem solving, if new developments or changed circumstances demand it, he can easily drop one line of thought or an unworkable approach and take up another. He shows resourcefulness in his ability to shift gears, to discard one frame of reference for another, to change perspective, modify approaches and adapt quickly to new developments or requirements. He constantly asks himself, "What else?" or "What would happen if I viewed the problem from a different angle?"

Scientist James H. Austin distinguishes between two kinds of flexibility: "One is the tendency to shift from one category of meaning to another; the second is loose and unstructured meandering of attention, a readiness to free associate, to daydream, to unleash one's thoughts into broad unclassified paths only tangentially related either to the starting point or to each other." Austin feels that this kind of flexibility *correlates* with the rapid production of original ideas.

It is said that necessity is the mother of invention, but there has been a curious lack of interest in discovering who the father is.

The associative links between the ideas and idea components the creative person forms during problem solving are loose, fluid, and capable of being dissociated and then reassembled into new patterns. He has no obsessional need to arrive at a closure by prematurely categorizing and structuring any of the elements he conceives. Rather, he prefers to consider, test, and weigh many configurations before choosing the one that will solve his problem. Able to perceive a problem from different viewpoints, he can bombard it with a variety of possible solutions. He is free from what can be termed the "hardening of categories."

Hardening of categories frequently occurs as a result of over-familiarity with an object. As the late professor John E. Arnold of Stanford University put it: "We see a pencil as only a writing instrument, we never see it as a tool for propping open a window, or as fuel for a fire, or as a means of defending ourselves in an attack. A pencil is a pencil. It is not a combination of graphite, wood, brass and rubber, each of which has multiple properties and multiple uses."

Originality

The creative person displays originality in his thinking. Since his thought processes are not clogged with stereotypes, he can reach beyond the ordinary or commonplace to think of unusual, unique solutions to his problems. His originality expresses itself also in his ability to take apart firmly structured and established systems, to dissolve existing syntheses and to use elements and concepts outside of their primary contexts to create new combinations, new systems of relationships.

In addition to this ability to fragment and differentiate, the creative person has the ability to find unity in diversity, to see unexpected relationships and kinships, similarities, likenesses, and connections between things, experiences, and phenomena that to the noncreative person evidence no relationship whatever.

The creative person is always in search of the new, always ready to see something unexpected, novel, and fresh in his experiences. He is receptive to unusual ideas, whether they be his own or others'. In fact, it has been noted that the creative person's open-mindedness sometimes extends to the point of gullibility in accepting bizarre or even crackpot ideas, and that he frequently considers such notions quite seriously before relegating them to the dustbin. New perspectives, new ideas, and venturesome concepts provide an endless source of exercise for his mind.

Originality feeds on change. It is for this reason that many creative

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individuals—through travel and immersion in new happenings—perpetually seek to re-experience the quality of freshness and the feeling of novelty.

Curiosity

Creativity is, in an important sense, contingent upon the preservation of the curiosity and sense of wonder that are so apparent in youth and so conspicuously absent in many adults. The educational and developmental processes most people go through, while ostensibly preparing them for the responsibilities of adulthood, nevertheless manage to conventionalize them to the point where lively curiosity and wonder almost cease to exist.

In addition to, or perhaps as a consequence of this, many adults have a deep distrust of originality, imagination, and fantasy. They often display this by being quick to criticize or dismiss thoughts that cannot be defended with fact or logic. There is little doubt that this closed-mindedness has invested much of our social environment with a timid cautiousness which prevents many valuable ideas from taking root.

Children have a keen and intense awareness of their environment. They have a ready feeling of curiosity about everything they touch or come in contact with, a precious propulsion toward seeking understanding, toward piercing the mystery they sense in everything they perceive.

> ***Creativity involves taking one step after another into pitch darkness.***

The rapt sense of children's wonder and the avid interest in the minutest details of their surroundings, indeed, the sheer poetic intensity of living, disappears sooner than any other characteristic of childhood. Only the truly creative individual manages to retain this early sense of curiosity. And it is thanks to this lively attitude of curiosity and inquiry that the creative person can constantly enrich and increase the store of information and experience that he draws upon when creatively engaged.

Another noteworthy characteristic of the creative person's wide-awake interest and attitude of inquiry is that it invariably extends far beyond the confines of his specialization or main line of work. His wide spectrum of interest embraces many related and unrelated areas, and he can get excited about almost any problem or phenomenon that puzzles him. Many things that are taken for granted by others are for him pregnant with mystery, puzzlement, and challenge.

In this sense he is intellectually restless; not satisfied with what is accepted, established, or known; constantly wondering how things could or might be; always ready to consider and visualize new possibilities. He feels that it is necessary to improve upon, or add to, existing things.

It is said that necessity is the mother of invention, but there has been a curious lack of interest in discovering who the father is. Could it be that the father is curiosity?

Feelings And The Unconscious

The creative person has more energy, is more impulsive, and is more responsive to emotions and feelings than is his less creative counterpart. Since he is more in touch with, and open to, his internal processes, the creative person has better access to the materials buried in his unconscious. Or, to put it differently, his ability to minimize his internal defenses and inhibitions—his relative lack of defensive distortions and repressions—enables him to have a more direct and uncluttered pipeline to the well of ideas in his unconscious.

According to psychologist Abraham H. Maslow, the really creative person is one who accepts his essentially *androgynous* character: "This is the person who can live with his unconscious; live with, let's say, his childishness, his fantasy, his imagination, his wish fulfillment, his femininity, his poetic quality, his crazy quality. He is the person, as one psychoanalyst said in a nice phrase, 'who can regress in the service of the ego.' This is voluntary regression. This person is the one who has that kind of creativeness at his disposal, readily available, that I think we're interested in."

According to Maslow's theory, there are two distinct kinds of creativity: primary creativity and secondary creativity. Primary creativity is the kind that emerges from the unconscious; is the source of new discovery, novelty, and ideas that depart from what exists at the moment; is common and universal to all people; is found in healthy children; comes from those who are able to play, dream, laugh, and loaf; comes from those who can be spontaneous, open to unconscious promptings and impulses; is present in those who accept their softness, femininity, and weakness; is found more among individuals who have a keen interest in the artistic and aesthetic fields.

Secondary creativity, on the other hand, is the kind that comes primarily from the conscious; comes from rigid, constricted people who are afraid of their unconscious and are cautious and careful in everything they do; comes from those who can't play very well and who excessively control their emotions; is characteristic of those individuals who demand a high degree of order in their lives and who dislike poetry and other expressions of emotion; is present among those who drown their childishness and who are afraid of their softness and femininity and who repress all weakness.

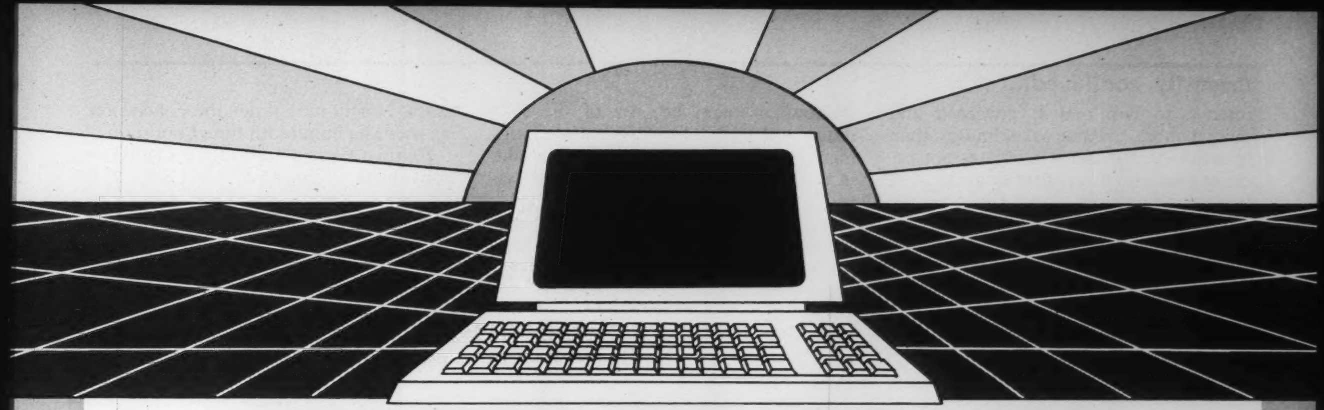
According to Maslow, the healthy creative person is one who uses neither the primary nor the secondary processes exclusively, but who has managed a fusion or synthesis of both the primary and the secondary processes, of the conscious and the unconscious, of the deeper self and the conscious self.

Since the creative person puts greater trust into his feelings and intuitive sensings, he is readily able to use them as guides to steer him during the creative process toward unique solutions to his problems. When judging the relevance of ideas that come to him during the process, he measures their appropriateness and pertinence by their feeling of fit and harmony.

Motivation

Basic to creative achievement is a strong desire to create. The creative person derives great satisfaction from his creative activities and is keenly interested in his chosen work and the materials with which he works. The difficulties that he encounters do not discourage him. He welcomes problems as personal challenges and looks forward to grappling with them. He assumes an optimistic stance vis-à-vis his problems and feels, like Pogo, that he is "confronted with insurmountable opportunities."

The creative person likes to pursue problems that are intrinsically of great



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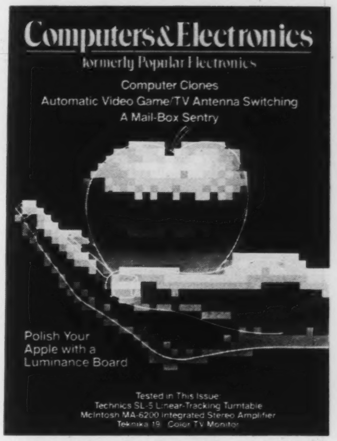

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interest to him and is governed and guided more by internal stimulus than by external demand. He creates not because someone wants him to create, but because he must. In a sense, he is at the mercy of his own values and motivations and deals best with problems to which he has a strong emotional affinity.

The highly creative individual is frequently haunted by his problems and cannot let go of them. Anyone who has observed the creative person at work has been impressed by the total absorption and vigorous concentration that infuses his activity. His strong sense of purpose and commitment and the intensity of his encounter with problems shows strong ego involvement. And this ego involvement is responsible for the unusual tenacity that the creative individual exhibits.

The creative person is ready to engage in meaningful problem solving purely for the satisfaction that it provides and even when there is no other reward in sight. This explains why he goes to great lengths to find problems that interest him and challenge his capacities. His motives are more internal and goal-oriented than competitive, and he is not unduly influenced by what others may be expecting of him.

His chosen work is the most important avenue for the fulfillment of his life and his striving for completion. He is dedicated to what he is doing, and enjoys it. Unlike many human beings, he is not preoccupied with the pursuit of happiness, but finds his happiness in the pursuit of creative activities.

Freedom From Fear Of Failure

Because the career orientation of most people is governed by the pursuit of success, the specter of failure looms large, and in the risk-taking enterprise of creativity, failures do sometimes occur. No new ground is completely secure under foot. One must respond positively to the risk and the challenge of exploring new frontiers. As Austin puts it: "Creativity involves taking one step after another into pitch darkness—not a fussy rearranging of familiar furniture in a flood lighted room."

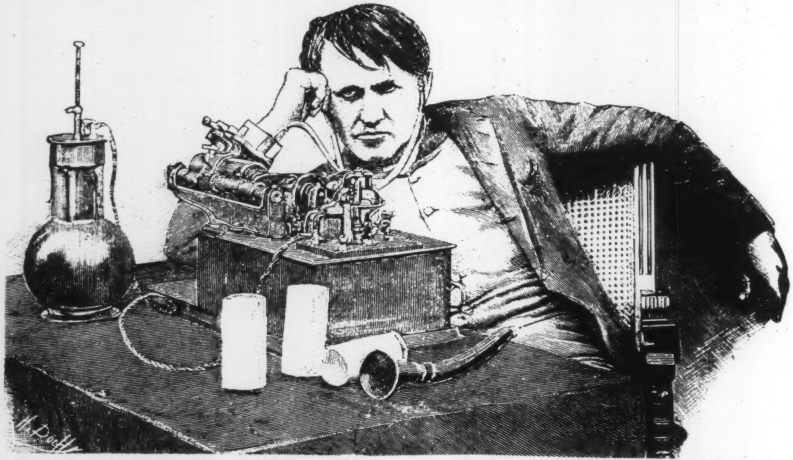
The attitude that is requisite for risk-taking is well expressed by the American painter, Albert Pinkham Ryder: "Have you ever seen an inchworm crawl up a leaf or twig and there, clinging to the very end, revolve in the air feeling for something to reach? That's like me. I'm trying to find something out there beyond the place I have a footing."

Fear of failure prevents many individuals from daring anything really creative, especially when risk is considerable. Their attitude of caution is dictated by their fear of failure. It casts a shadow on them because of the self-induced responsibility for accurate judgment they have and the pride they take in their ability to work and plan successfully. This ability to exercise sound judgment nevertheless qualifies their willingness to risk the kind of leap into the unknown that is involved in genuine creative advances.

Actually, failure should be regarded as a "learning situation"—a situation from which new or improved ideas may arise. Almost every new development has had a history of failures that led ultimately to success. In reality, the greatest failure is the failure to attack a new idea at all.

Persistence and Concentration

An enormous capacity for taking pains, a dogged persistence in the face of difficulties and frustrations, and a vast amount of sheer hard work are some of the other outstanding attributes that mark the creative person. These qualities stand out in their biographies and are also the ones they emphasize most when counseling others with creative aspirations.



The popular notion that the creative individual relies mainly on effortless inspiration and enforced spontaneity is a widespread misconception. Few people realize that creative achievement requires a hard core of self-discipline and arduous, unceasing application. It also requires confidence, the maintenance of morale, and long-lasting pervasive excitement to resist stubbornly premature discouragement in the face of difficulties and temporary failures.

Although the creative person occasionally experiences failure, he is not downed, crushed, or maimed by it. He feels that any adversity he experiences is only temporary and will exhaust itself if he persists. As Einstein once remarked, "I think and think, for months, for years. Ninety-nine times the conclusion is false. The hundredth time I am right."

From talking to highly creative individuals, it becomes clear that the majority of them are unfamiliar with the eight-hour workday. Their preoccupation with problems is incessant. Occasionally they may have moments in their work that are crowned with joy, when, for example, they find that ideas begin to flow after they have surmounted a disruptive hurdle.

But frequently the intense struggle with problems does not yield immediate solutions. As someone put it: "Creativity can be, and often is, a savage experience demanding hard work and the willingness to live with a task to a self-defined conclusion."

Creation is preceded by hard thinking, prolonged reflection, and concentrated hard work. There is a continuous assimilation of new knowledge and experience, a continuous pondering of the causes of the difficulties that are encountered regularly, and a sorting out of hunches and ideas that flash across the firmament of consciousness. That all this takes time and willingness to experience and accept many agonies along the route is apparent.

Many creative individuals have been threatened—especially when their wastepaper baskets overflow with discarded worksheets—to quit their work for good. In the face of insoluble snags and feelings of helplessness, even digging ditches looks like an easy way out. But the next day they are back, probing and attacking problems, determined to complete what is unfinished, the image of road gangs all but forgotten.

Quite often conscious efforts in the beginning stages of creative problem solving are abortive and useless; creative individuals have testified that they frequently give up their efforts temporarily, that many of their initial attempts end in failure, before valid solutions or ideas emerge. Still, all these apparently futile initial efforts are not wasted, but serve to activate the unconscious processes of cerebration and incubation. Without preparatory work, the unconscious can be notoriously unproductive.

It is true that some creative people rely deliberately on the gestative process of the unconscious to produce ideas for them. With most creators, however, a dogged and intense preliminary effort—much exhausting spadework—is the necessary prelude to original production. The capacity for original work grows out of long training, constant application, and unflagging persistence.

Since, in the course of creative work, a lessening of persistence frequently occurs—sometimes due to repeated failures, at other times to lessening of interest—the creative person soon learns to cope with this reaction.

Discomfort with persistence or a feeling of flagging interest is often a signal of the need to get away from a problem and relax for a while. Creative individuals often find that they can relax by attacking another challenging problem. Many of them say that they function best when involved in several undertakings simultaneously, each at a different stage of development, each affording an opportunity to relax when interest or ability to persist in working at one problem fails.

The creative process also requires concentration and continuous thinking to the extent that the creative person becomes oblivious to his surroundings. During the creative process he maintains an uninterrupted rapport with his unconscious and formulates the emerging proposals into a sensible solution. This requires disciplined concentration.

Philosopher Richard Guggenheimer explains it this way: "A great disciplinary effort is required for most productive minds before they reach a stage where they are able to swiftly launch themselves into completely spontaneous absorption in the creative business at hand. A thousand and one diverting thoughts must be suppressed; the mind must brush aside myriad temptations to amble here and there along the enticing byways of casual thinking. It must become totally involved in the mounting wave of its deep intent. The principal labor is getting the wave started; most of us splash about in our thinking and mistake the ripples of our noisy commotion for real movement."

Of course, when there is a complete and wholehearted absorption in the business at hand, the activity itself helps the process along. Suggestions on how to proceed occur spontaneously. The creative person no longer has to use his energy to force his mind to concentrate on the problem. Where great disciplinary effort is invariably required, however, is at the beginning stages of the problem solving process. It is at these stages that many extraneous thoughts must be discarded or suppressed in order to plug into the creative current. ☐

Mr. Raudsepp's profile of the creative individual will be continued next month.

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Randomness and the Mind

Looking for Psychic Effects in Games of Chance

Helmut Schmidt

Does the outcome of a game of chance depend on the player's mental effort? Certainly effort can help where skill and strategy count. But what about pure chance games like roulette, or those computer games in which we can do nothing but wish for success?

With these questions we strike the core of an ongoing controversy about the existence of some "psychic" effects that may not quite fit into our present worldview.

The first laboratory reports that gamblers and other people might mentally affect the outcome of dice falls were published in 1942 by L. and J.B. Rhine who labelled this the "psychokinetic effect" (PK).

These early claims were, rightly or wrongly, much criticized. The effects were rather small. Even the best performers scored only slightly better than chance would dictate. Statistical evaluation methods were required to detect the effect—like a weak signal in much noise. The critics wondered in particular whether the manual recording of thousands of dice throws might have left room for systematic recording errors.

The introduction of electronic test equipment has revitalized this kind of research. We no longer have to worry about recording errors or the monotony of dice throwing. Any home computer can be programmed to act as electronic dice tumbler or coinflipper to tally the scores and to present the participant with stimulating feedback.

Using such test equipment, several research groups have reported weak, but, nevertheless, significant PK effects. And this type of work is being continued in physics and engineering departments of universities, industrial research laboratories, and private research foundations.

But with the reported effects rather weak and at odds with our conventional thinking patterns—with what we call common sense—many critics still see room for doubt in the reality of psychic effects. Could it be, perhaps, that the researchers overlooked something, that they made some blunder, or that they even have an urge to deceive themselves or the public?

We certainly want to know whether or not mental effort matters in games of chance.

This psychic controversy is carried out in the home territory of computer enthusiasts. And we certainly want to know whether or not mental effort matters in games of chance.

After some experimenting, I am no longer neutral in the controversy. But rather than discuss my own results, I want to show you how you can try to catch PK in action. If a large number of experimenters were able to observe the effect, the question about its existence would be settled once and for all.

Experimenting in this field can be great fun. We can design and play challenging games, and at the same time do fundamental research. This may be one of the few areas of science in which the newcomer can still contribute to progress.

From Dice to Radioactive Decay

The early researchers saw psychokinesis as a mental "force," comparable to the known electric or magnetic forces. Surprisingly, however, the participants in their experiments seemed able only to affect *rolling* dice; they could not exert a measurable force on a die placed on a sensitive scale or suspended as a pendulum on a string.

What makes a rolling die different is the element of randomness that enters into the outcome. And today it appears that PK might be able to act wherever truly random processes are in progress.

The idea that part of nature may be governed by pure chance, was one of the more sensational outcomes of modern physics. The textbook example of a pure chance process is radioactive decay. If I

Helmut Schmidt, Mind Science Foundation, 102 W. Rector, San Antonio, TX 78216.

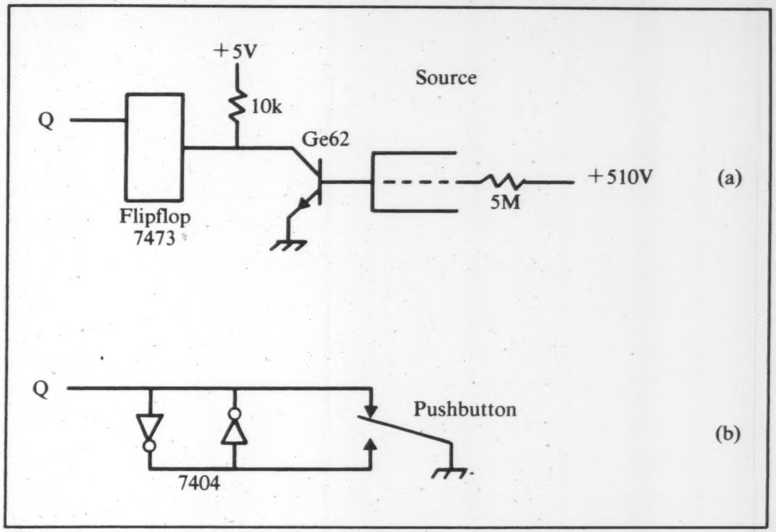
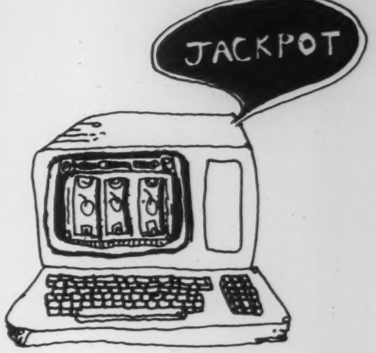


Figure 1. (a) Geiger Counter Circuit. The flipflop is toggled at random time intervals. Position the source for an average counting rate of about 40/seconds.
Geiger Tube: Amperex 18504
Source: Sr90, 0.1μC (from Nucleus, P.O. Box R, Oak Ridge, TN 37830).
(b) The electronically clean manual switch can also provide truly random timing.



have a sample with many atoms of radioactive Strontium 90, then I can register the individual atomic breakups as clicks on my Geiger counter, and I can calculate that a Strontium atom has an average lifetime of 30 years. But according to quantum therory it is impossible to predict when a particular atom will decay. There seems no mechanism inside the atom that determines the decay in a computerlike (deterministic) manner. The decay is rather the result of pure chance.

The first successful attempt to mentally affect radioactive decay was reported by R. Chauvin in Paris. In this experiment children tried to speed up or slow down the counting rate of a Geiger tube during one minute time intervals. This appeared to work more often than not. Two 13-year-old boys were particularly successful as long as the experimenter could keep them sufficiently motivated and excited about the experiment.

Chauvin's neat experimental setup has some minor practical disadvantages: the base counting rate must be re-calibrated frequently, the power supply must be very stable, and the experimenter must make certain that a fraudulent participant does not introduce his own radioactive source (such as a radioactive watch dial) to affect the counting rate.

Therefore, in my own experiments, I used the randomness of radioactive decay slightly differently, as basis for a digital random number generator (RNG). I then had the participants try to affect the output of the RNG.

The basic idea behind the RNG experiment is very simple: you have a very fast and regularly advancing binary counter which you stop at the random time at which the Geiger tube registers the next signal. Then the lower digits of the counter stop in truly random positions, provided that the average waiting time for the next signal is long enough that these digits have been turned over many times.

A True Random Number Generator

To implement the RNG with a computer, you can use the external circuit of Figure 1a which connects to an input port Q of the computer. The flipflop in Figure 1a changes state with every decay signal, i.e., at random intervals. A machine language program loop can provide the needed fast counter. Figure 2 shows a corresponding flow chart.

But remember that your computer may steal computer time for the direct memory access of the screen display. In this case you must disable the interrupts to guarantee the smooth progress of the counter while you are waiting for the next random number. If you don't want the screen to flicker for each random number request, you must generate and store all needed random numbers at the start of the game. You could also avoid screen blanking by including a fast hard-

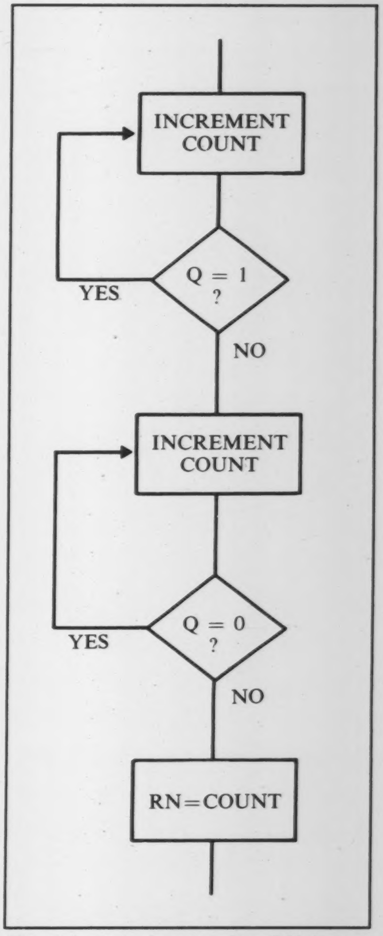


Figure 2. A random number, RN, is generated by stopping a fast counter at a random time, when the input Q goes from 0 to 1. The lower bits (or digits) of RN are truly random, provided that the average waiting time for a Q change is long enough, so that these bits (or digits) have been turned over many times.

ware counter in the external circuitry.

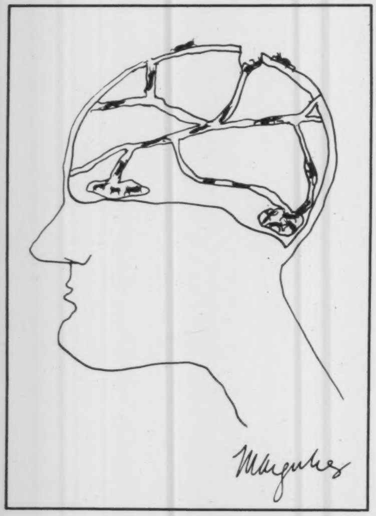
With the arrangement shown in Figures 1a and 2, you get truly random numbers. Even if you produce millions of them, no computer should be able to detect any systematic pattern in the sequence.

I had great fun and no difficulties in setting up the Geiger tube circuit. But if you don't need too many random numbers at once, there is an easier way. You can use the randomness in the timing of a manual buttonpush. Instead of the Geiger tube setup in Figure 1a, you connect the electronically clean switch of Figure 1b to the computer input. For an even simpler setup, you can let a computer key take over the role of the external switch in Figure 1b as well.

From the time that your brain decides to press the key, as the nerves conduct the signal and the muscles execute the command, so many truly random processes in your body have entered in that the timing is (within certain limits) truly random. With a fast machine program loop, you should get perfect randomness.

For preliminary experiments you might be somewhat sloppy and create the counter with a Basic loop, particularly if you need only a binary decision (even or odd counter reading). You might also find a memory location that is automatically incremented with each screen refresh, and use that as counter.

It is possible to use electronic noise as a source of randomness. The basic idea is again very simple. Feed white noise into a pulse counter so that the counter advances rapidly at random intervals. Whenever you need a random number, read the counter. In this manner you can generate random numbers at very high rates. But the setup requires more external circuitry and much care in design. In particular, you must filter the noise so that no marginally weak signals can reach the counter.



The Size of PK Effects

The PK effects reported in rigorous experiments have been rather small. That may be the nature of the phenomenon, or it may be that test conditions tend to inhibit an effect that depends much on enthusiasm, confidence, and emotional involvement.

Take as the first example an experiment that you could easily set up for yourself. When a key is pressed, the computer makes a binary random decision for a "head" or "tail," and displays the result as a red or green signal respectively. You choose your favorite color, say, red. And then you wish for red to appear whenever you press the key. You might do this in a very relaxed atmosphere, taking much time to visualize the target color. You could also use a more aggressive approach, fighting for each trial. In either case you should start a test session only when you feel in top shape, and keep the sessions short (perhaps 20 trials per session). Stop whenever you want. The computer tallies the hits and misses (red and green signals) and at the end of each session you record the scores, manually, or automatically on disk. If you like the setup and the results look promising, then you might go on and try to accumulate "statistically significant" results (see Table 1).

It is possible to use electronic noise as a source of randomness.

When I tried this experiment, I used two colored lamps as a display. The lamps were in sockets close to the participant; the RNG, computer, and recorder were in another room. It was easy to verify that the RNG alone, running by itself in the absence of onlookers, showed no bias. But as an additional safeguard, I used in the PK test each of the two sockets (connected to "heads" and "tails") equally often as the target side. The participant simply inserted his favorite color lamp into the target socket. In this way, even a constant generator bias could not simulate a PK effect.

I did not seem able to produce PK effects myself, but I found several promising volunteers who enjoyed the experiment. When we felt sufficiently confident, I began a "real experiment" with a total of 3000 trials. The 35 participants contributed different amounts, depending on their availability and interest.

We obtained an average success rate of 54.5% (where 50% is the chance expectancy). With the large number of 3000 trials the result is statistically significant (Table 1), i.e., the outcome cannot be reasonably explained by pure chance.

This was a very slow experiment, with an average trial rate of perhaps one ev-

Assume that we have N trials in an experiment, and that each trial can produce a hit with the probability P (P=½ for coin tosses). The chance average number of hits in the N trials is then N*P.

Suppose our game was successful, so that the actual number, H, of hits is larger than N*P. Then we want to know whether we were just lucky, or whether the result is due to some systematic effect (like a loaded die, a warped coin, a biased RNG, or, if everything else can be excluded, PK).

To estimate the significance of a particular score, let us ask: What are the statistical odds against obtaining this number H or a higher number of hits as result of a chance fluctuation? These odds can be obtained from the Z-value:

Z=(H-N*P)/SQR(N*P* (1-P)).

This value tells by how many standard deviations the result lies above the chance level.

Then we can use available tables to calculate the corresponding "odds against chance." The following table is sufficient for most purposes:

z	Odds
1.65	20:1
2.17	50:1
2.33	100:1
3.09	1000:1
3.71	10000:1
4.26	100000:1
4.75	1000000:1

Let me take as example the mentioned experiment, where clicks were presented at very high speed to the right (hit) or left (miss) ear. In a total of N=200,000 binary trials, the number of hits was H=100,774. (That gives the mentioned scoring rate of 50.39%.) With these values for N and H, and P=½, we get z=3.46. And from the table we see that the odds against chance (as an explanation of the high score) were larger than 1000:1.

Table 1. Statistical Significance.

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ery 15 seconds. With higher trial rates one might hope to gather data more efficiently.

To study an extreme case, I used random noise to obtain binary decisions at a rate of 300 per second. This time, the heads and tails were clicks in a right or left headphone. That way, you cannot quite distinguish the individual clicks. But you still hear statistical intensity fluctuations. And for obtaining more heads than tails you can aim at more action in the right headphone. Since this takes much concentration, I used only short runs of 1000 trials (about three seconds).

In a total of N=200,000 trials (200 runs), we got a success rate of only 50.39%. But the result was still significant (Table 1).

The decline of the scoring rate at very high speeds is certainly disappointing, but not surprising. There was really not enough time to focus on each individual event.

```
10 P=524287:M1=79:M2=3067
20 H=0:T=0
30 ?"ENTER 6-DIGIT SEED":INPUT R
40 FOR TRIAL=1 TO 100
50 R=M1*R-P*INT(M1*R/P)
60 R=M2*R-P*INT(M2*R/P)
70 IF R>262143 THEN 90
80 ?"HEAD":H=H+1:GOTO 100
90 ?"            TAIL":T=T+1
100 NEXT TRIAL:?:?:?
110 ?"HEADS= ";H;"   TAILS= ";T
```

Starting from a seed number SEED=R(0), the algorithm provides a sequence R(1), R(2), R(3)....of quasi random numbers, where R(N+1) is obtained from R(N) by the Basic substitution

(1) R = M*R-P*INT (M*R/P),

with

(2) $P = 2^{19-1}=524287$, M=M1*M2=242292.

Note that R(N+1) is the remainder in the division of M*R(N)/P, so that all R(N)s are restricted to the interval

(3) $O < R < P$,

provided that the seed is not zero or a multiple of P.

One can show, that sequence (1) repeats only after P-1 steps, and that each number in the interval (3) appears exactly once in the sequence.

Noting that, in binary notation, P is a row of 19 1's, the interval (3) covers all binary 19-digit numbers, with the exception of O and P. Using the particular form of P, one could write a very fast machine language routine for the algorithm (1).

The program lines 50 and 60 split the algorithm (1) into two steps. That prevents the appearance of too large integers that your computer might truncate. Line 70 makes a decision with the probability $\frac{1}{2}$.

Listing 1. Quasi Random Algorithm.

Right and Wrong Mental Attitude

If PK is real, one wonders what practical role it may play in our lives. With the effect rather weak, nature may have decided to use it only sparingly. To succeed in life, even I would rather trust my powers of sound reasoning than my PK powers.

But you don't have to be a professional gambler or a salesman to realize that there are some situations in which we can do nothing but wish for a good outcome. And if PK could help us to increase our chance of success by only a few percent, it might be worth the effort.

We can simulate real life situations with games and study how chance may be affected by the right or wrong mental attitude.

You don't have to be a professional gambler or a salesman to realize that there are some situations in which we can do nothing but wish for a good outcome.

The results of the following simple game may surprise you. A player advances in single steps by pressing a key. With each step, the computer obtains a true random number in the range from 1 to 4. For a 1, 2 or 3 you hear a pleasant low tone, you have made a "safe" step. If, however, the random decision is for a 4, you hear an unpleasant loud beep or explosive sound. The player's goal is to take as many safe steps as possible.

Try first a positive approach. Spend some time putting yourself in a calm, confident mood. (Try to recall and savor a situation in which you were particularly successful.) Then start the game. After a false step, stop for a moment to regain your confidence, and stop the game for the day whenever you feel apprehension or fear of a false step welling up.

Next explore the effect of a negative mental attitude. Imagine vividly how scared you are of a false step (Think about stepping on a bomb, getting an electric shock, or feeling the dentist's drill hitting a nerve). How are you scoring now? Can the negative attitude work against you, so that more than 25% of your steps are bad?

Fortunately, being scared can be fun (that's why we watch Hitchcock movies), so experimenting with your friends or with groups of children can be quite enjoyable.

Quasi Random Generators

In slow games, like the last one, the timing of key presses can provide all the randomness we need. For fast action with many random decisions, an external random source with radioactive decay or electronic noise comes in handy. But can we perhaps use the Basic RND function instead?

This function is based on a quasi-random algorithm. Starting from a seed number, the algorithm derives a sequence of numbers that appear to be random. Nevertheless, the whole sequence is pre-determined by the seed number.

Listing 1 contains its own quasi-random algorithm. After a seed number is entered, the program prints HEAD or TAIL in quasi random sequence, and after 100 trials the score is tallied. For a simple PK test you might display the heads and tails as high and low tones. Note that using the same seed number twice, leads to the same sequence and the same score. And no PK effort can change that.

We might give the PK mechanism a chance to act by selecting the seed number randomly, by the timing of an initial key push. Then the outcome would be unpredictable and you would almost always get different sequences of heads and tails. But with the seed number and the outcome of the game fixed at the start, you would feel rather foolish making a mental effort during the game. You wouldn't want to assume that such effort could retroactively aid in the selection of a favorable seed number. But try it anyway, particularly with participants who do not know the details.

There is another way to bring the psychic element into play more directly.

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Use the quasi-random generator to supply a sequence of heads and tails, but provide an "option" button such that pressing the button inverts the decision of the quasi-random generator.

Then, starting from the same seed number, you can get different game histories, depending on when you press the option button. Working always with the same seed number, you might soon learn at which times in the game to press the button to succeed. This game would test your memory and your skill.

To make it a clean psychic game, you must start each time with a truly random seed number. Since you don't know the seed number and the subsequent quasi-random sequence, there is no systematic strategy for success. If you show in the long run a significant winning tendency, it can be due only to some psychic mechanism.

You could call the mechanism in this case *precognition.* You might foresee when the quasi-random generator is going to work against you, and then hold the option button down to invert the decision.

In the laboratory, precognition and PK appear closely related, and it is often impossible to distinguish one from the other. They are probably based on some common "psi principle," in which psi includes PK, precognition, and the other forms of ESP.

Design of Psychic Games

Should we modify available games or design new ones for the study of psi effects?

Some games may need little change. When the player has skillfully guided his missile toward the enemy ship, you can let a truly random cointoss determine whether the ship blows up or the missile is repelled.

In the laboratory, precognition and PK appear closely related.

In the end, you display next to the total score (resulting from skill, strategy, and chance), the psi score that reflects the player's "luck" in the game, i.e., his success with the chance decisions.

Challenging the player to display not only his skill and cleverness, but also his psychic powers may add a new dimension to the game. Even though the effects are small on the average, the correlation between your momentary mental state and your psi score may be striking.

Most of the previous work has been done with very simple games in which skill and strategy play no part and in which we have only one thing upon which to concentrate. (A collection of ten such games for the Atari is available through the Mind Science Foundation, 102 W. Rector #215, San Antonio, TX 78216. Text and Basic listings, $15; same with listings on disk, $23. If you can feel challenged by simple games, they might give you the best opportunity to explore your own PK. You can liven up the games with mental pictures and discover what mental state seems best for success.

Extremely fast games that strain your eyes and your hand muscles might not work quite as well on the psychic level, because you may be too distracted—but we don't really know. With some people the complete involvement in some skill task may carry a subconscious PK effect.

The real challenge for game designers might lie in setting the stage for a basically simple chance event. When the plane drops its bomb, let the bomb gather speed gradually and emit the eerie sound of the bomb, and then let a random event decide whether the bomb really explodes on impact. ☐

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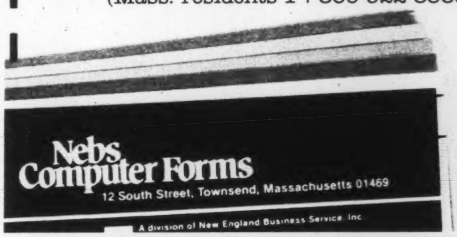
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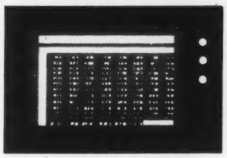

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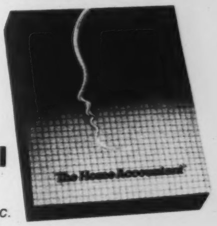

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The Emerging Information Age: Computers, Communications, and People

1983 NATIONAL COMPUTER CONFERENCE

May 16-19
Anaheim, California

David H. Ahl

The National Computer Conference (NCC) is one of the largest, if not the largest, conference and trade show in the United States. Prior to the opening of NCC in Anaheim May 16-19, AFIPS officers were estimating attendance as high as 125,000.

There is no question that the number of attendees was enormous. When asked for a final total after the show, however, AFIPS officials refused to reveal one. We can only conclude that this means the attendance fell short of their published expectations—perhaps far short.

In addition to the staggering number of attendees, there were far more exhibitors than could be accommodated in the Anaheim Convention Center. As in past years, part of the overflow was housed in the Disneyland Hotel Convention Center and in the indoor garage one level below. Savvy convention-goers quickly learned that the best way between the two floors was through the restrooms; this convenient passage saved a 50-yard walk up an outside ramp.

In addition to the Disneyland Hotel, six temporary buildings were erected in the Convention Center parking lot. These Sprung Instant Structures were composed of aluminum frames covered with plasticized fabric. They were quickly dubbed the tents, and, despite large air conditioning units, proved to be heat collectors beyond compare. After high noon, only the hardiest of attendees ventured into the tents for more than 10 or 15 minutes at a stretch. We had to pity the 635 exhibitors stuck there and pity their equipment even more.

Editor Betsy Staples and friend.

In total, there were over 3200 exhibitors located in the nooks and crannies of the Convention Center, arena, hotel, and, of course, the tents.

NCC is a place for vendors to exhibit their latest wares. Because of its overwhelming size, few companies find it a good place to introduce brand new products—they just get lost in the shuffle. Of course, there are exceptions (IBM introduced their long-awaited System 36; NCR announced seven new processors in the V-8600 family; and several Japanese companies showed new products). On the other hand, NCC is often the first time many previously-introduced products are displayed in the flesh in public. Some of these products are described below.

But there is more to NCC than a trade show. It is, after all, a conference, and there are conference sessions to satisfy practically every taste and interest. A session on personal computers rehashed what we and the other magazines have been saying for years, namely that these machines are truly useful and have a place on practically every businessman's desk as well as in most homes. What a surprise!

Somewhat more of a surprise was the number of people interested in micro-to-mainframe links. The ultimate goal seems to be some sort of virtual terminal built in to a microcomputer, but at the moment, most of the approaches are based on software. The reasons for such a link are many: It would allow a manager to download sales information on his brand or geographic location and analyze it with a spreadsheet program. It would also overcome some of the storage limitations of micros. While there were many networking products at NCC, most were designed to link up similar computers (North Net for NorthStar computers, Wang's Local Interconnect Option for their machines, Applenet, etc.). However, in the coming years, we expect to see more and more products like Ethernet designed to link dissimilar computers, and, more particularly, micro-to-mainframe links.

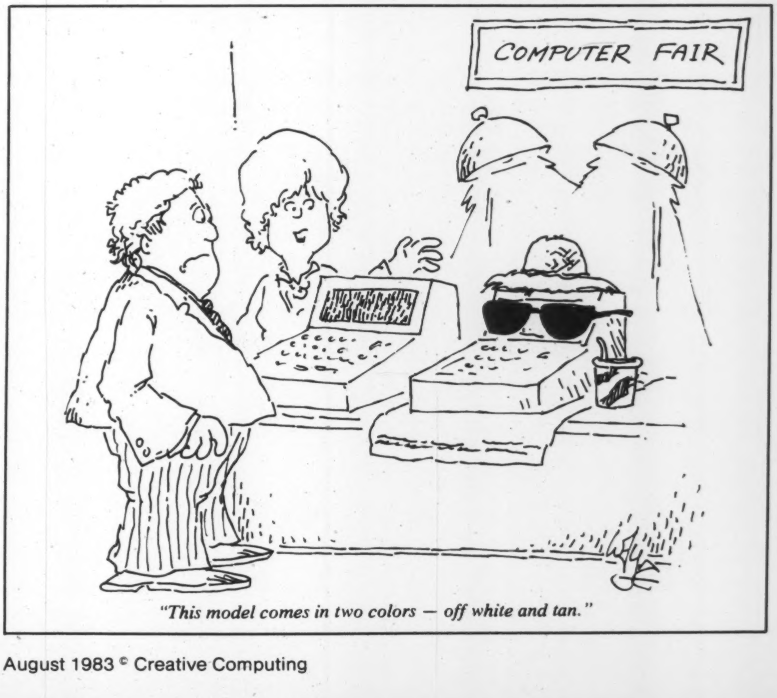
At another session, experts representing various fields of computing warned that the United States is likely to lose its position of prominence in the coming years. While consortia of high-technology companies are working feverishly in Britain and Europe, clearly the biggest threat to U.S. supremacy is Japan. According to experts in artificial intelligence, numerical computation, and defense systems, the long-term research program established by Japan's Ministry of International Trade and Industry (MITI) will make Japan the computing leader in the world by 1990.

MITI development projects now underway are focusing on artificial intelligence, computer-aided design, manufacturing, and large-scale numerical processing. According to Professor Edward Feigenbaum, an AI expert at Stanford, Japan is focusing on areas of technology which will be the most pressing in the world ten years from now. In summary, this session was an ominous warning to U.S. education and industry.

John Imlay, chairman of Management Science America, gave the keynote address. He also mentioned the threat from Japan and called for a national policy to combat the "brain intensive" Japanese. In a far-ranging multi-media presentation, Imlay said that computer terminals will soon become extinct as they are replaced by personal computers with advanced software. He also cautiously supported the Apple Bill, while warning parents and educators of being outpaced by their computer literate children and students. On the other hand, he said, "It is more important that your son or daughter have a computer than an automobile."

"It is more important that your son or daughter have a computer than an automobile."

As for Apple, they are not waiting for the Apple Bill to pass, and announced a program to donate a computer to every one of the more than 9000 public and private schools in California. The program is called "Kids Can't Wait" and will be described in an upcoming issue.



"This model comes in two colors — off white and tan."

NCC is also a place for awards and for honoring people of the industry. Wednesday was designated Pioneer Day and focused on the work of Howard Aiken (1900-1973) and his colleagues at the Harvard Computation Laboratory 40 years ago. In 1944, after five years of effort, the room-size Automatic Sequence Controlled Calculator was unveiled to solve naval navigation and ballistics problems. It was the first in a series of large-scale computing machines which came to be known as Mark I, II, III, and IV. While the Mark I was electromechanical, the Mark IV boasted diode logic circuits, magnetic core shift registers, and a drum storage unit.

Captain Grace Murray Hopper was one of the first people to learn how to program the Mark I, as well as the Mark II and III. She was also a key figure many years later in the development of the Cobol language. For this, as well as for her "continued support for high standards in computer education," Capt. Hopper was awarded the ACW Ada Augusta Lovelace Award for Excellence.

Also honoring a pioneer in computer education, AFIPS' first annual Education Award was presented to John Kemeny of Dartmouth College for his "visionary efforts in making computing universal for students of all disciplines." Kemeny was codeveloper with Tom Kurtz of the Basic language and the Dartmouth Timesharing System.

Other awards went to Dr. Gene Amdahl (developer of the IBM 360 architecture, and founder of Amdahl Corp. and Trilogy Systems) and Dr. Richard Tanaka, president of Systonetics, for his 19 years of service to AFIPS.

AFIPS, by the way, stands for the American Federation of Information Processing Societies. Member societies include the Association for Computing Machinery (ACM), Association for Educational Data Systems (AEDS), Data Processing Management Association (DPMA), Society for Computer Simulation, IEEE and six others.

New Products at NCC

Reinforcing the view that the Japanese are getting a lead in computing was the showing of the first production 256K memory chips by **Fujitsu**. The company announced that the chips will be incorporated into a new 8/16-bit microcomputer on a single plug-in board. This is part of the Micro 16 Personal Business Computer. With dual Z80 and 8086 processors, 1Mb of RAM, two double-sided double-density 8" floppy disk drives, and a 40Mb hard disk, the Micro 16 carries a retail price of only $2495.

Before I get to the other new products and almost new products, I would like to nominate this announcement for our jargon of the issue award. **Kodak** announced an "Isomax floppy disk drive" capable of storing data in both a horizontal and vertical format. It employs "an isotropic cobalt-enhanced magnetic particle, which can record data at a variety of angles, ranging from the conventional horizontal format up to a vertical or perpendicular format." Jargon aside, this is a neat product as it is able to increase the amount of data stored on a 5-1/4" floppy disk from about 1Mb to 10Mb.

Speaking of packing density, **Sony** announced a 3-1/2" microfloppy drive that can store up to 1Mb of data. This is a double-sided, double-density unit with 80 tracks in contrast to the earlier 70-track design. Sony also announced a single-sided drive with 500K capacity.

Not to be outdone, **Tandon** also announced a 1Mb 3-1/2" drive, and we would expect other manufacturers to make similar announcements in the near future.

As you might have gathered, some of the most interesting new product announcements were from the Japanese companies.

Although many of the products will never reach these shores in quantity, the level of advancement of Japanese technology and quality has to be seen to be believed.

Another nifty Japanese entry was the PC-5000 from Sharp.

Sord is one of the largest consumer electronics manufacturers in Japan, yet they have never been a factor in the U.S. market. From their new announcements, it looks as though that might change.

At the low end, they announced the M5 computer. This will be sold in two versions, the M5 Fun Computer and the M5 Multi-Computer. The Fun Computer is a cartridge plug-in unit for games only. The other model includes two versions of Basic, one for calculations and the other for graphics.

The compact M5 uses a Z80 mpu, has an 8K ROM with the operating system; 4K of RAM expandable to 32K; "Chiclet-style" keyboard; RS-232, cassette, and Centronics parallel ports; and two "joypads" (Intellivision-type game controllers). Basic price $199.

BASIC-G
SORD

Sord M5 is a capable little computer for $199.

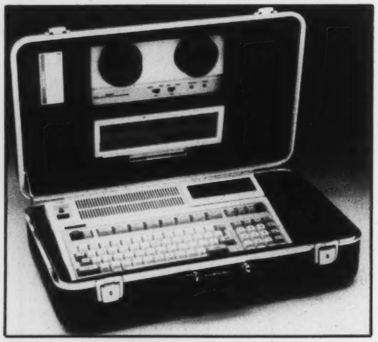
PIPS III
SORD's No-programming Language

Sord M23 uses PIPS III, a no-programming business planning system.

The upscale M23 computer is available in two basic versions, portable and desktop. This Z80-based machine has 128K of memory and two disk drives in one of three sizes (3-1/2," 5-1/4," or 8"). It has exceptional graphics resolution (640 x 256 pixels) in eight colors.

The most intriguing aspect of the M23 is the software. In addition to Basic, the M23 runs PIPS, a no-programming business planning system. PIPS is similar to a spreadsheet calculator, but uses direct commands and requires no advance programming. The 43 interactive commands include MT (make table), SORT (sort data), and CT (change title). A basic M23 portable system retails for about $2195.

Toshiba, another Japanese firm, also had several interesting entries. Most intriguing was a portable version of the T100 personal computer housed in an attache case. The basic unit is similar in size to an Epson HX-20 or Tandy Model 100, although the 40-character by 8-line LCD display is in a separate module from the computer itself.



Toshiba Portable 100 has a detachable LCD display and modem.

The T100 has 64K of memory built in; external non-volatile RAM packs are also available. List price on the portable T100 is $795; the LCD display costs an additional $295.

Toshiba also announced a major price reduction on the full-size T100 system with cpu, 64K, monochrome display, two double-sided double-density disk drives, CP/M, and a full range of software (word processing, spreadsheet, CBasic, TBasic and more). New price $1995.

The top-of-the-line Toshiba T300 is a 16-bit machine that runs IBM PC software but is more than just a PC clone. Graphics resolution is a spectacular 650 x 500 addressable pixels in eight colors. A sleek, detachable keyboard, 192K of RAM, slim-type 640K floppy disk drives, and seven expansion slots round out the package. Base price is an attractive $2495.

Toshiba T300 runs IBM PC software but has spectacular high-resolution graphics.

Another nifty Japanese entry was the PC-5000 from **Sharp**. This 11-pound portable unit operates on a rechargeable battery and uses a 16-bit 8088 mpu with 128K of memory, expandable to 256K.

In addition, 128K bubble memory cartridges are available for off-line mass stor-

Sharp PC-5000 is a 16-bit portable with 128K, folding display, and optional printer.

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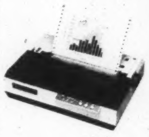

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NEC 8023/DMP 85	$Call

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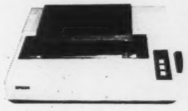

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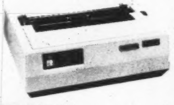

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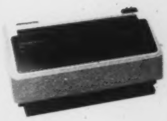

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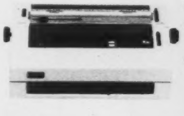

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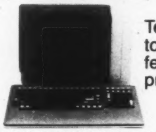

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age and applications software.

The LCD display panel folds flat against the PC-5000 for carrying. In use, it displays 8 lines of 80 characters with bit mapped graphics capability (640 x 80 pixels).

An optional printer adds to the versatility of the PC-5000. The printer will print on either thermal paper or plain paper with a carbon ribbon. It prints 80 characters per line, 10 or 12 pitch, at 37 characters per second.

Projected price of the computer is $2500; no price on the printer yet.

Sanyo was showing their range of small business computers. The low-end MBC 1000 is built around a Z80 mpu and has 64K and an extended version of Microsoft Basic, dubbed SBasicII. The unit is also said to support CP/M. A 12" monochrome screen and single 5-1/4" floppy disk drive are built in.

The MBC 1200 has a similar appearance to the 1000, but has dual Z80 mpus so there is rarely a wait mode. The computer is designed for high resolution graphics and has a 640 x 400 pixel monochrome display along with two double-sided, double-density disk drives.

The up-scale MBC 4000 is a 16-bit unit built around the 8086 mpu. It has 128K of memory, expandable to 512K. The software, including Basic and Goal (a spreadsheet), operates under CP/M-86.

In the April issue of *Creative Computing* we had a sneak preview of a Commodore 64 in a compact case. This is now officially designated the Commodore Executive 64 and is shipping in limited quantities. It has 64K of memory, a detachable keyboard, 5" color monitor, and a built-in 170K floppy disk drive with an option for a second drive. The size is a diminutive 5" x 14-1/2" x 14-1/2". Price is $995 with one disk drive, $1195 with two.

Commodore Executive 64 has 64K, 5" color display, and is two-thirds the size of an Osborne.

Commodore was also showing a pair of new streamlined computers, the B128-80 and BX256-80. The B model uses a 6509 mpu (6502 compatible) with 128K of memory (expandable to 256K), has an 80-character x 25-line display, ten function keys, numeric keypad, RS-232 port, IEEE-488 bus port (Commodore does not support the Centronics parallel protocol), and 8-bit user port (whatever that is). Price $995.

Commodore BX256-80 has dual 8-and 16-bit mpus, 256K, detachable keyboard, and room for two disk drives.

Initially, the BX model appears similar to the B model. But there are more differences than similarities. The BX case has a swivel-and-tilt CRT display mounted on it and is designed to accept one or two floppy disk drives. Also, the keyboard is detachable. Internally, the BX model has dual processors, an 8-bit 6509 and a 16-bit 8088, along with 256K of memory. I/O is the same as the B model, and both speak Basic 4.0, a proprietary Commodore version. Don't expect immediate delivery; as of NCC, the engineers had been unable to fit any disk drives into the space allowed in the sleek case. Price $2995.

Lobo Systems were showing their Max-80, a direct-sold computer with a hard-to-beat price of $945. The Max-80 uses a Z80B mpu at a 5MHz clock rate (that's 2-1/2 times faster than most Z80 machines). It has 128K, floppy and Winchester disk interfaces, two RS-232 ports, a Centronics port, built-in clock with battery backup, 24-line x 80-character display, and full keyboard with numeric keypad.

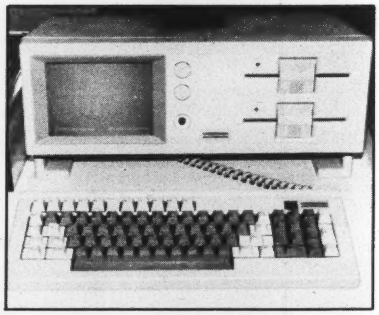
Max-80 from Lobo Systems has 128K and lots of extras for only $945.

A dual 5-1/4" double-density, double-sided disk drive (690K total) is priced at just $695. A 1.4Mb unit is priced at $895.

In addition, the Max-80 comes with CP/M Plus, an enhanced version of CP/M 2.2. Also available for an extra $69 is LDOS which allows the unit to run most TRS-80 Model III software. All in all, I was most impressed with this system!

Eagle was showing three lines of computers, the 8-bit (Z80A) IIE series, the 16-bit (8088) PC series, and the 16-bit (8086) 1600 series. The PC series is (surprise!) compatible with the IBM PC in both software and hardware. With *Eaglewriter* and *Eaglecalc*, it seems to have some pluses in the software department. The price is right: $1995 for a 64K unit with one disk drive, although the $2995 configuration with 128K, monitor, and software packages is likely to be more useful. Be sure to watch for a complete, in-depth evaluation of the Eagle PC on these pages in the near future.

In the IBM act-alike department, **Anderson Jacobson** introduced the AJ Passport with 256K, one or two disk drives, serial and parallel ports, built-in 300-baud modem, 640 x 250 pixel display, and built-in clock with battery backup. Unlike the IBM PC, the Passport is exceptionally compact (18.3" x 11.3" x 8.8") and has a built-in 7" amber display screen. Layout of the keyboard is more sensible than the PC with the menu for the ten function keys appearing on the bottom line of the display. A single-drive system with software bundled in is priced "in the low $3000 range."



Anderson Jacobson Passport is a snazzy IBM PC clone with some nice additional features.

Computer Devices, a 14-year-old maker of portable terminals, was showing their Dot computer. This is a compact unit with 16-bit 8088 mpu, 128K of memory (expandable to 704K), dual Sony 3-1/2" floppy disk drives, integrated 9" monitor (green or amber) with an astounding 1056 x 254 pixel resolution, 300-baud modem, two RS-232 ports, clock with battery backup, and a built-in thermal printer.

▷ indicates price decrease
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Hayes Smartmodem 1200 - outsells the rest	$515▷
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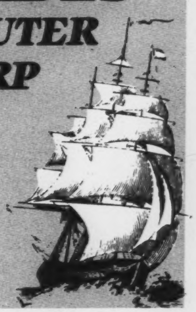

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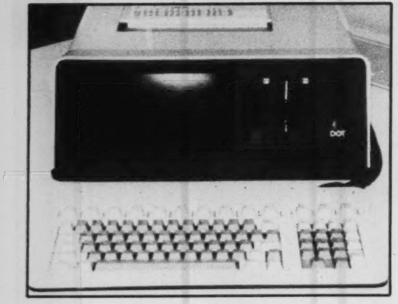

Dot computer from Computer Devices uses 3-1/2" floppy disks, has a 16-bit mpu, 128K, and high-resolution display.

Computer Devices has been busy lining up software firms to write packages for the Dot and already offers MS DOS and all the Microsoft languages, *Multiplan*, the *Datamension Manager* series of packages, *Volkswriter* from Lifetree, and accounting and database packages from both Timberline and Pearl. Not bad at all for $2995 (single drive). The printer costs another $599, modem $225, and software packages $175 and up. Watch for a review on these pages.

More than a small surprise were the Decision Mate V small business computers from **NCR**. Both 8-bit (Z80) and combined 8/16-bit (Z80 and 8088) versions are available with very high resolution monochrome and color displays. The 8-bit only model is priced at $2650 and the 8/16-bit one at $3440. With luck, you'll see a review soon.

NCR Decision Mate computer comes with either 8-bit or combined 8/16-bit mpus.

Another mainframe maker, **Honeywell**, also introduced a "low-end" desktop unit. The microSystem 6/10 is software compatible with the large Honeywell DPS 6 computer family and thus is off to a running start with scores of software packages. The 6/10 has dual processors (Honeywell LSI 6 and 8086), 128K, dual 5-1/4" floppy disk drives, swivel display, detachable keyboard, and the expected I/O ports. Base price is $3995.

Honeywell microSystem 6/10 is compatible with larger Honeywell systems so much software is already available.

If you have $3995 to spend and would rather have a portable unit, consider the **Gavilan** mobile computer. This is a notebook-size unit (11.4" x 11.4" x 2.7") with a 16-bit 8088 mpu, 80K of memory, 3" microfloppy disk, RS-232 interface, 300 baud modem, and full-stroke keyboard. That's for starters. It also has an LCD display (8 lines x 66 characters) with a Lisa-like (*VisiOn*-like?) software system of windows, files, menus, and interactive prompts. To select what you want to do, a 3.5" x 1.4" solid state touch pad is mounted above the keyboard; your finger takes the place of the mouse on Lisa.

Gavilan Mobile Computer is completely portable, has 16-bit mpu, 3" floppy disk, LCD display, touch pad, and optional printer.

Software comes in small plug-in cartridges and includes word processing, a spreadsheet, communications package, and forms processing package. All this is powered by a rechargeable battery pack.

Gavilan also announced a portable 50 character-per-second correspondence quality printer powered by its own built-in battery pack. The printer costs an extra $985. Delivery is supposed to start in October. We can't wait.

Names and Addresses

For more information on any of the products mentioned in this NCC roundup, write directly to the company at the addresses listed below (please mention *Creative Computing*) or circle the designated number on the Reader Service card bound in the back of the magazine. ☐

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CIRCLE 287 ON READER SERVICE CARD

Another Successful Show

CP/M '83

Ken Uston

The CP/M '83 Show in the beautiful City By The Bay, San Francisco, was a crashing success. More than 600 companies exhibited, and the show was seen by an estimated 80,000 attendees from all over the world.

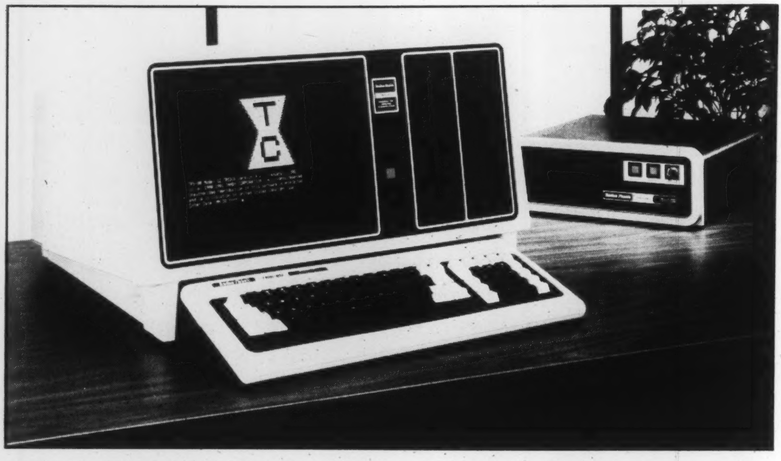
CP/M, of course, is the operating system developed by Digital Research, Inc., Pacific Grove, CA, the sponsors of the show. About 5000 companies produce CP/M compatible software for more than 650 computers that run the system.

Exhibitors included Digital Equipment Corporation (the world's second largest computer manufacturer) and other hardware producers such as Radio Shack, Franklin, NCR, and Sanyo. Software companies such as Datamost, Hayden and VisiCorp also showed their wares.

There were vendors who sold merchandise right on the floor. There was even a little San Francisco bookstore that has metamorphosed into a software training center and hardware dealer.

Radio Shack Model 12

Radio Shack teased us all with a big picture in a double page ad in the show program with a big picture of a computer under a black hood ("still under wraps"). At the show, they unveiled their mystery computer. It was the TRS-80 Model 12, which Radio Shack heralded as "the first of six new computer announcements" (I tried to find out about the other five, but none of the Radio Shack people admitted to knowing what they were. I suppose, in retrospect, that two of them were the Model 4 and the Model 100).


The Radio Shack Model 12.

The Model 12 has a Z80A 8-bit processor, 80K RAM, and an 82-key keyboard with eight special function keys. It is compatible with TRS-80 Model II software and can also be upgraded to "true 16/32 bit processing" with a Model 16 Upgrade Kit.

A company representative told me that Radio Shack had received much criticism about the drab colors of their other computers. To correct this, the Model 12 is contained in an attractive white case. The computer can have one or two built-in 1.25 Mb disk drives and lists at $3199 (one disk drive) or $3999 (two disk drives).

Franklin Ace 1200

Franklin came out with yet another Apple look-alike. They held their first operating showing of the Franklin Ace 1200 (a preliminary "prototype," mostly a keyboard and case, was shown at Comdex in November, 1982).

The 1200 has an 8-bit processor, 128K RAM (using bank selection), color capability, upper- and lowercase, and a numeric keypad. It can handle any programs that run on the Apple II without

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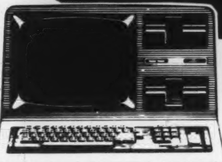

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The Franklin Ace 1200.

modification. For a list price of $2195, we also get a built-in floppy disk drive (143K capacity) and controller, a CP/M card, and an 80-column card.

NCR Decision Mate And Network

NCR announced two products, a personal computer called NCR Decision Mate and a computer network system, the Decision Mate V Network.

Decision Mate is an 8-bit 64K unit, with two double-density $5^1/_4$" disk drives with .5 Mb (unformatted) capacity. The detachable keyboard has 20 function keys and a numeric keypad. The basic computer lists for $2650 ($3100 with the 8088 16-bit processor add-on).

The Decision Mate V Network allows the networking of the NCR computer as well as IBM PC or Apple computers. Individual computers are tied into a central computer and can access data or programs in a central storage device. The system also allows print spooling (data is spooled to disk and stacked up in a job queue for processing by a central printer).

Robot Redford

A computer show wouldn't be complete without a robot, and CP/M '83 was no exception. Roaming around the aisles, embarrassing women and exchanging repartée with gregarious businessmen and computer hackers was Robot Redford. Mr. Redford, who didn't look quite like his namesake, was complete with red, white and blue baseball hat, a built-in TV to show us what we look like on the screen, and a computer keyboard.

The robot is a product of Superior Robotics of America, whose president, Bill Bakalienikoff, told me that the robot goes to about 50 shows a year. If you happen to be interested in having a Redford of your very own, he will set you back $1200 per day for one day ($800 a day for three days), and he comes complete with two (human) operators. Expenses, of course, are extra.

Perfect T-Shirts

Perfect Software added to the variety of the show with a giveaway and contest drawing. They handed out 4000 "Perfect" T-shirts. Each day a drawing was held among the thousands who filled out forms (not a bad way to get a mailing list cheap, I would guess), and one computer was given away daily—a KayPro II, Access Matrix and Basis 108. At 5:00 p.m. on the final day, 50 names were drawn, and the winners were given copies of *Perfect Writer* and *Perfect Speller,* a package with a list price of $695.

VisiOn

One of the most interesting demonstrations was by VisiCorp, who showed their new VisiOn package. The VisiOn "operating environment" allows a variety of software applications to take place simultaneously. VisiOn is designed to re-create the user's desk top on the computer screen, and I think they have accomplished their purpose.

The demonstration was impressive. We saw several spreadsheets on the screen at the same time; they were consolidated into a total spreadsheet by the touch of a key. The sheets overlapped just as they would if stacked on our desks, and we could call any one we wanted to the top of the pile. A pointing device called a "mouse" directs the cursor on the screen by being moved on any flat surface. The mouse directs the computer by pointing either to commands at the bottom of the screen or to specific data within one of the spreadsheets. (Other mice were also shown at the show. Yes, one from TeleVideo was called Supermouse).

We were shown how data contained in the spreadsheets could be instantaneously plotted onto bar charts. The mouse can be used to make any of the sheets or "windows" any size and locate them virtually anywhere on the screen.

The system demonstration had Visicorp's word processing program, *Visiword,* built-in. This made it possible to include charts or tables in the body of a document. Thus a user may write a report and incorporate the necessary statistical tables or charts as he progresses.

The package will be for the IBM Personal Computer. Visicorp also has an agreement with Digital Equipment Corporation to make VisiOn available for their computers, but apparently some details have yet to be worked out between the two companies.

Everybody's Gettin' Into The Act

Columbus Discount Books displayed racks of computer books and software. Their president, Gary Pallister, took over this 25-year-old book company located in the heart of the San Francisco North Beach area (diagonally across from Carol Doda's infamous topless night club). He gradually converted the emphasis of the store to computer books. Then he added software to the line, everything from *Word Star* to *SuperCalc*, and the store was converted into a software training center. Victor 9000 computers are used, and Columbus Discount Books will become further entrenched in the industry by becoming a dealer for Victor computers. Who says the Era of Electronics isn't here?

The Father of CP/M

Among the many presentations at the show was a talk about CP/M by its founder (and president of Digital Research), Gary Kildall. His speech was given in a room which seated 2500. The room overflowed with people, so Gary gave the presentation a second time. Yup, the room was totally packed again.

I didn't hear the talk, but was told it was quite informative. Cassette tapes of the speech are available (although much of its effectiveness may be lost on tape since so many visual aids were used).

Digital Research

Digital Research made ten announcements at the show. One of the most significant was the introduction of an enhanced version of CP/M 86 for the IBM PC. (Digital produced the original CP/M 86 and sold the rights to IBM.) The new version includes a printer spooler capability and GSX, a feature that permits improved graphics. The package will be marketed through Digital's dealers and will compete with the original system.

Digital also announced PL/I-86, a 16-bit version of their PL/I compiler, and CB86, a 16-bit rendition of their CBasic compiler (called CB80).

Try It, You'll Like It

A company called Softlink introduced a concept called Softlok. Softlok allows users to try software packages, paying $40 rather than the full price. A vital function of the software is "locked up" (for example, the store-to-disk capability), preventing its full use. If the user decides he likes the program, he goes to the dealer and pays the balance. The dealer calls Softlink, and gets a "keycode," with which the user may unlock his piece of software.

Apparently this encryption process has some validity in the eyes of the venture capitalists. Softlink announced more than $1.5 million in funding from U.S. Venture Partners and Rothschild, Inc.

Preventing Piracy

Urban Pacific Data Service came out with Prolok, which they say will "all but eliminate piracy." Here's how it works. Software producers and others buy Prolock disks, which have a built-in fingerprint, that is, a series of random program encryptions "and other devious programming techniques," which protect the program.

The final user may make back-up copies of his master, but the master disk must be the one used on the computer. If the user ruins the master, he copies from the back-up to the master and uses it once again. This will work if the master "crashes" and can be recopied onto. But what happens if we spill ketchup or ice cream on the master, rendering it unusable?

Retail Sales

Parts of the show reminded me of San Francisco's Ghiradelli Square, where street vendors peddle their goods. Several companies sold everything from computers to joysticks. One, 800 Software, did a booming business selling software at a discount (typical prices: *Mail Merge,* $79; *Word Star,* $239; *dBaseII,* $399; *Perfect Calc,* $139). Ira Weise, the president of this mail order house, told me, "We're content to make one-third of what a retail store makes." Another company spokesman said, "We've had an excellent response. We've taken more than 300 orders during the show, and there are still four hours left." (If the average sale was $150, they booked $45,000 worth of business at the show. Not bad!)

A Software Buying Service

Interactive Tele-Marketing (ITM) displayed an interesting software buyer's service at the show. For $100, you get a catalog that ranks software by type (e.g. spreadsheet, database, education, household and personal). You learn which software is outstanding and which is the most popular. Members also receive a monthly software newsletter and periodic reports on software. The report they gave me covering the second generation of electronic spreadsheets was well written and easy to understand. ITM also sells software to members, usually at one-third below the list price. Members are also entitled to software consultation over the telephone.

Other CP/M Shows

A representative of Digital Research told me that the company was so delighted with the response to CP/M '83 that CP/M '84 is a certainty. It will be held in January at the Moscone Center in San Francisco.

There's little doubt in my mind that we'll be seeing at least two CP/M shows a year, for many, many years to come. ☐

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Eagle 1620	$3,599	$4,495
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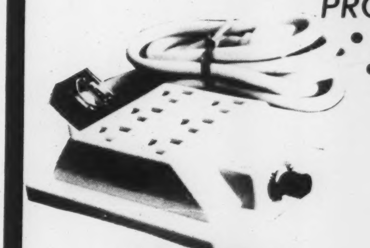

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Datalink	$ 65
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Wordstar (Spanish)	$299
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Beagle Bros./Utility City	$ 20
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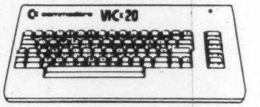

Newly Arrived

Franklin Ace 1000

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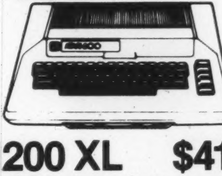

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Switch-Type Joysticks for Atari and Apple

Tom and Kelda Riley

This month we are going to look at some homebuilt joysticks for Atari and Atari-compatible systems. We will describe two different designs for Atari joysticks: One is similar to the commercial unit, but the other is a new type of joystick that can be customized for individual hand fit and high-speed action. We also include the electronic circuit needed to wire these Atari joysticks for use on an Apple computer.

The Electronics Of The Atari Joystick

The Atari joystick is simply a collection of five normally-open momentary-contact switches. These switches allow the computer to detect movement in eight directions and to read the input from a fire button. Four of the switches are paired so that only one switch at a time can be pressed. One pair controls up and down on the screen, the other pair controls left and right. The switches are paired by mechanical linkage rather than by electrical circuits. The fifth switch, the pushbutton, is mechanically independent of the others, but all share one common electrical conductor.

This construction is completely different from that of Apple-type joysticks, which feature two lever-controlled variable resistors. The Apple type are analog input devices, having many values over their range, while the Atari type are digital, with only a few discrete input commands.

In an Atari joystick you need precise control so that you can give an exact command every time, good feel so that your hands don't tire, and, above all, speed. Another helpful feature, but one that most commercial joysticks for the Atari lack, is tactile feedback, which means that there is a definite sound and feel when electrical contact is made. The joystick should also have good mechanical strength to insure long life, since it will see heavy use.

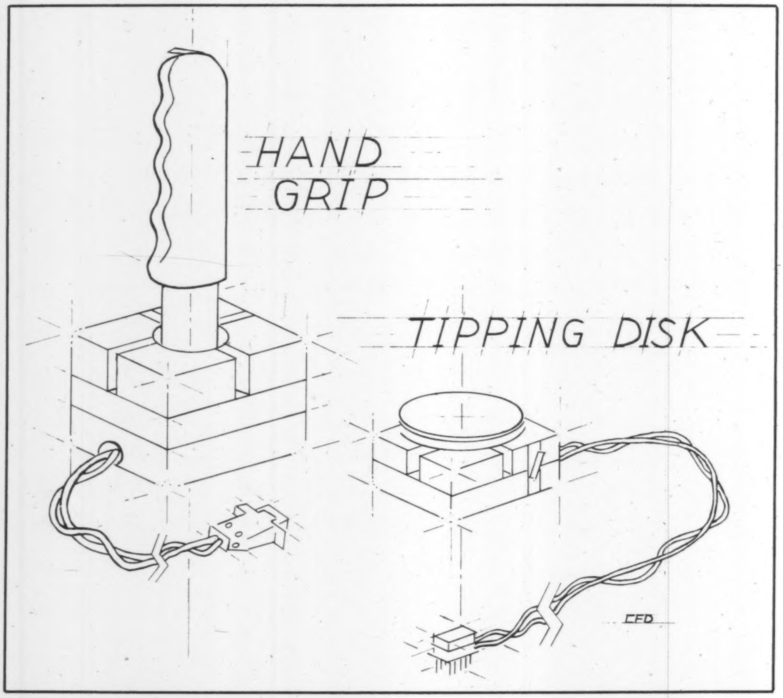

Figure 1. Joystick sketches.

The most common commercial units for the Atari do not meet the above requirements. They are often awkward to hold, particularly for lefthanders; it is difficult to tell when contact is made; and handle movement is limited and rubbery. We think you will have a much better joystick if you build your own. Constructing an Atari-type joystick may seem to be a somewhat mundane exercise, but working out the details of precise, rapid hand movement makes this task an excellent lesson in man/machine interface.

Features Of Two Homebuilt Units

Figure 1 shows sketches of two joysticks for the Atari. Each unit is constructed from a block of hardwood in which the switches and wiring are embedded. The hand grip joystick, like

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Tom and Kelda Riley, 1002 Lewis Ave., Rockville, MD 20851.

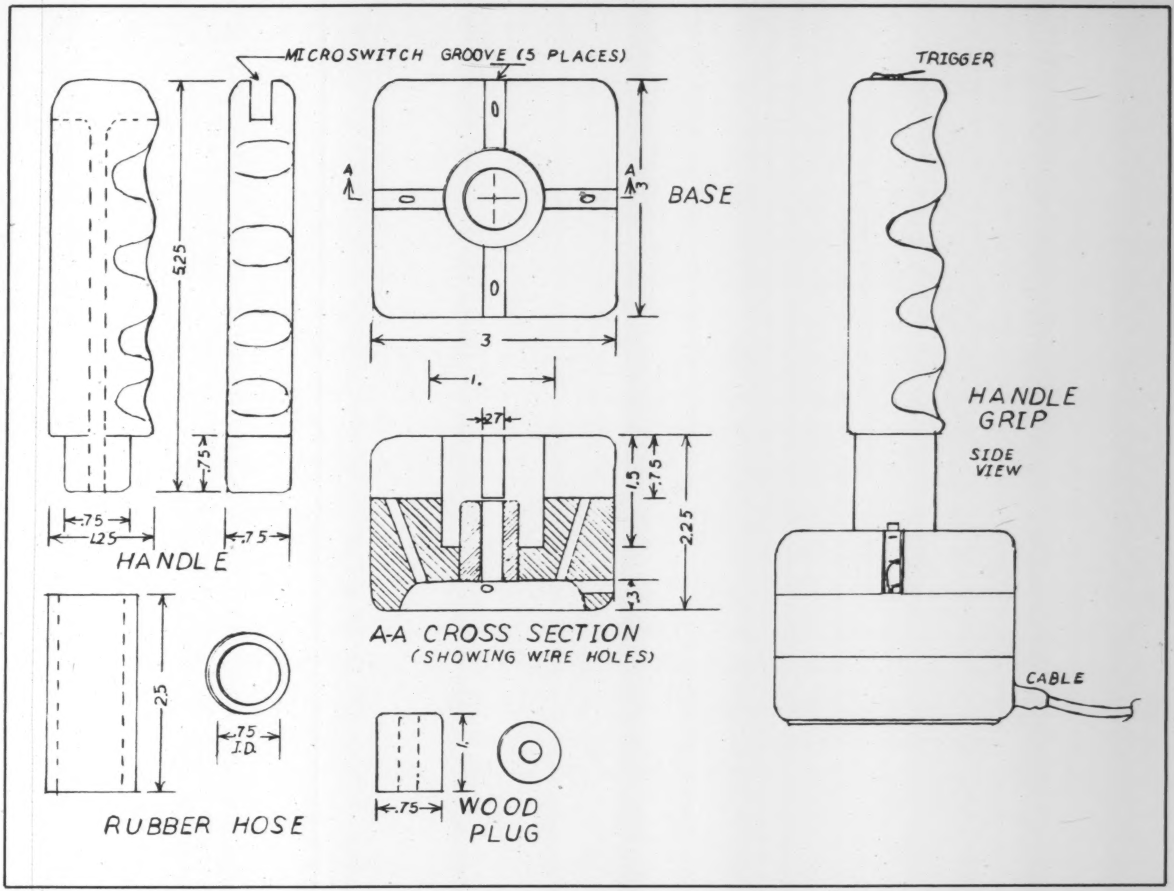

Figure 2. Atari joystick.

the standard unit, is used by holding the block in one hand and the grip in the other. The fire button on top of the handle will feel natural to most players. The weight of the homebuilt unit improves the feel, and the switches click to give you tactile feedback.

"Gee, this 'Lost In Space' game is intense!"

To operate the tipping disk unit, you hold the block in one hand and work the fire button with the index finger of that hand. (Your index finger can press a button more quickly than your thumb.) With the finger tips or palm of your other hand you press the disk to direct the movement. With the tipping disk joystick, the player controls the computer with hand movements that are quite different from those of the conventional units.

Construction Of The Hand Grip Joystick

Figure 2 presents a side view of the component parts of the hand grip unit. The base is a hardwood block that you make by gluing three $^3/_4$" thick boards together. We used oak for all the wooden parts of the prototypes, but any attractive wood free from cracks and large knots will do as well. You can use clear pine, but the finished unit will not be as strong or good looking.

Cut the microswitch grooves with a dado blade in a table or radial arm saw (or use a router or handsaw). Since it is somewhat difficult to cut grooves in this small a block with a power saw, you might want to start with three 14" x 3" boards. Apply carpenter's glue and clamp them together. Drill the large holes and cut the microswitch grooves for four blocks into the one large piece. This accomplished, you can saw the large piece into four blocks. This is easier than trying to work with a small block and increases your cost very little. If you want to make only one joystick, choose the best of the blocks and discard the others.

Cut out the large central hole with a hole saw in an electric drill or with a large adjustable auger bit in a brace. It is easiest to do this before the grooves are cut.

The rubber hose shown in Figure 2 serves as a flexible joint. It is the type used for automobile heaters and was purchased at an auto supply store. Other types of hose may be used if they are

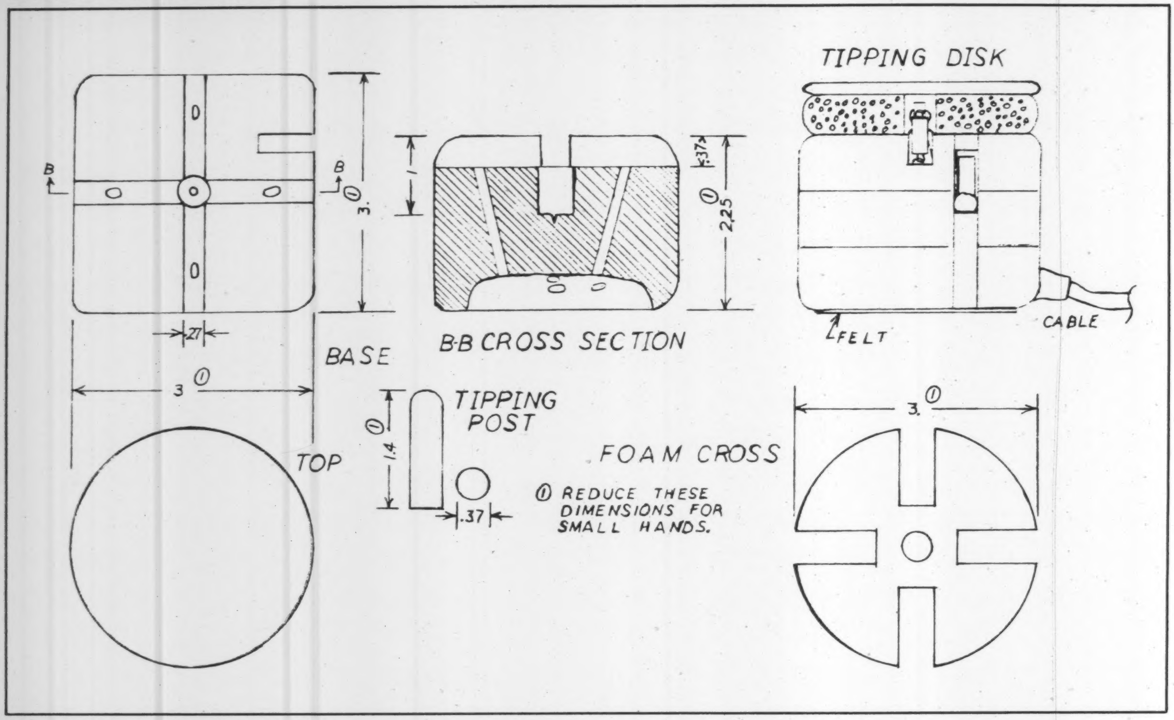

Figure 3. Tipping disk joystick.

springy and not too stiff. Size the wood plug and the base for the hand grip for a snug fit in the hose.

The hand grip was cut from a single piece of 3/4" thick lumber. With a wood rasp, contour the front of the grip to fit the fingers of your hand. The microswitch groove was cut with a small handsaw and a 1/4" wood chisel. If you prefer, you can move this switch to the front of the grip so that you operate it with your index finger rather than your thumb. The hole down the middle for the fire button wires was drilled was a 1/4" paddle drill.

Drill the hole for the wood plug and then carve out part of the bottom of the block to make a cavity in which to place the wire connectors. Glue the plug in place. For the wire of each microswitch drill a 3/16" hole; drill a slightly larger hole for the main cable. All of these holes lead to the bottom cavity.

Rasp off the outside corners of the block. (The amount of rounding off you choose to do is one aspect of customizing your unit.) Sand all surfaces smooth, taking special care with the hand grip. The best finish for the wood parts is two coats of polyurethane varnish.

The Tipping Disk Joystick

The construction of the tipping disk is much the same as that of the hand grip unit. If anything, the tipping disk is easier to build. Figure 3 shows details of the parts. Cut out the three pieces of hardwood and glue them together. As noted before, it is easier to make several blocks at once and cut them apart later. Drill the 3/8" central hole and cut the microswitch grooves, following the instructions for the hand grip unit.

The groove for the fire button is on the side of the block; in Figure 3 it is shown for right-handed players. The right- or left-hand orientation of the unit is set when you cut this groove and the hole for the main cable. To locate the groove properly, hold the partially finished block in your hand and find the most comfortable place for your index finger.

Drill the holes for the wires and the main cable and chisel out the bottom compartment as before. Round off all outside corners until the unit rests comfortably in your hand, and sand all surfaces smooth.

The tipping disk itself is made of masonite or other thin material. It can be any diameter that suits you, either larger or smaller than the base block. Cut it out with a coping saw, and round off and smooth the edges. The disk and the block should be finished with polyurethane varnish before you begin wiring the unit.

The tipping post is a short piece of 3/8" dowel, one end of which is rounded. The exact height of the post and shape of the rounded top affect the feel of the finished joystick; so it is one of the key elements for personalizing the unit. Do not glue this piece into the block until you have tried the action and shaped the end to get the response you want.

The springy foam cross that fits beneath the disk was cut with household scissors from 1/2" thick polyurethane shipping material. The thickness and shape of this foam piece is another important element in personalizing the unit.

Adjusting The Size

The dimensions given for both of these joysticks will produce a unit that fits an adult's hands. Smaller hands will need a smaller block. You can reduce the 3" square dimension of the block to as small as 2 1/4" for the tipping disk and to 2 1/2" for the handgrip unit. The smaller blocks are somewhat harder to wire. If you cut a wood block large enough to make three or four units, you can cut them down to the exact size you need. (Remember the woodworker's lament, "I've cut if off twice already, and it's still too short.")

Electrical Components

The key electrical parts of these units are the switches; they are, in fact, almost the only electrical parts. Radio Shack

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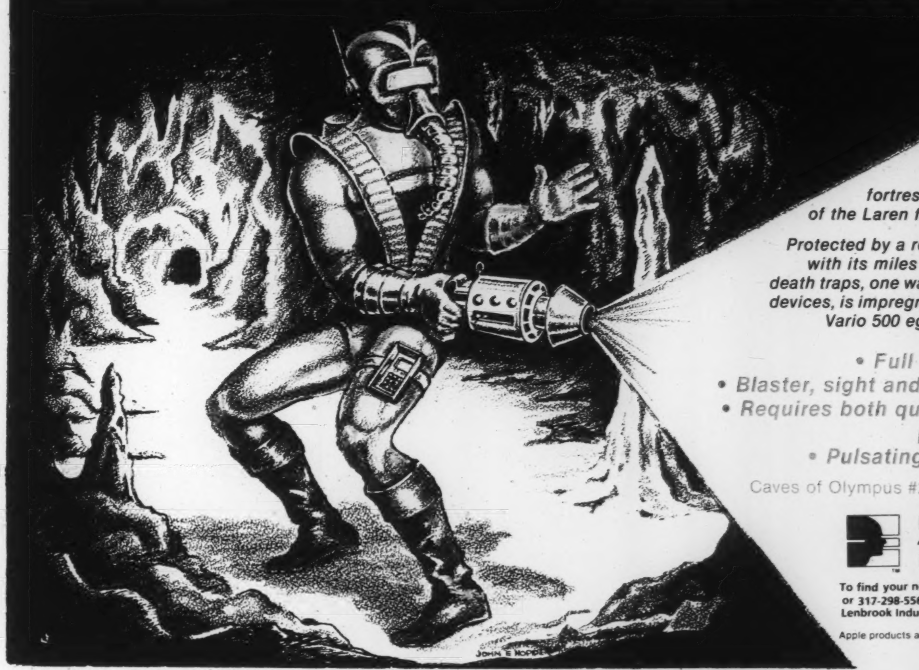

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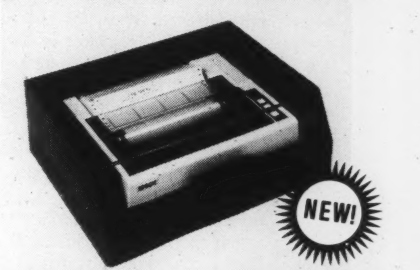

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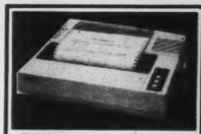

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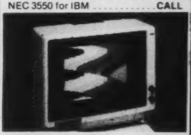

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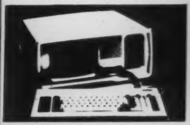

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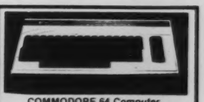

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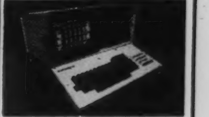

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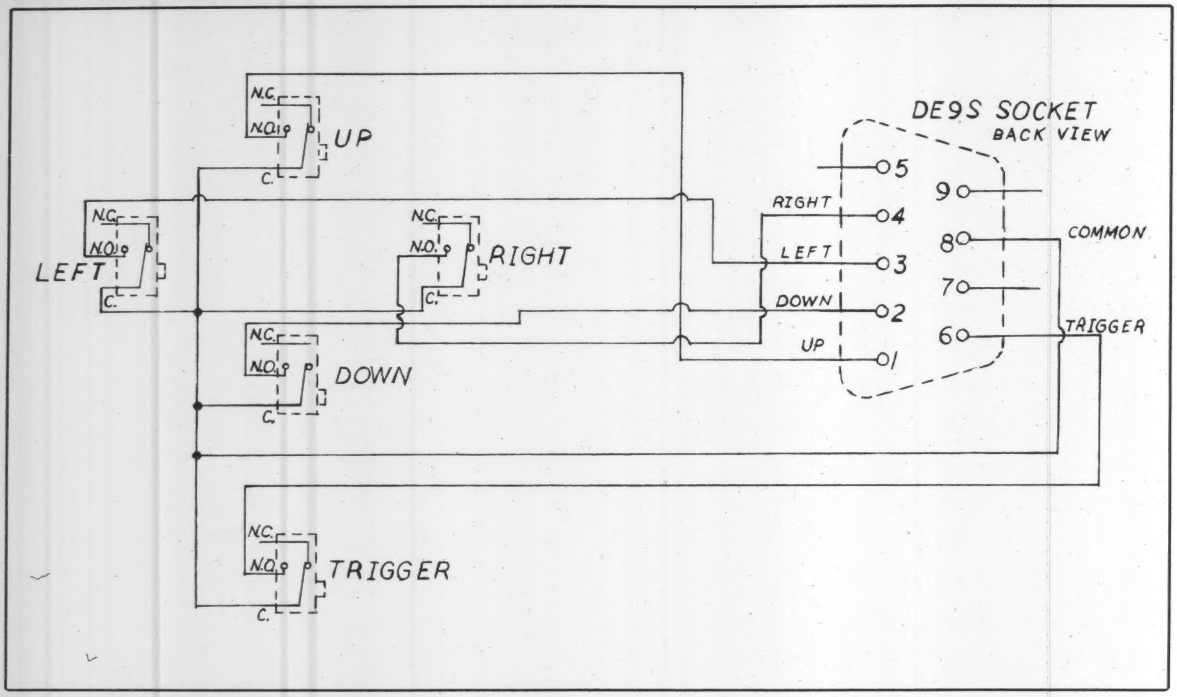

Figure 4. Microswitch Atari joystick.

Submini Lever Switches were used for the prototypes. Discount mail order houses like PolyPaks (16-18 Del Carmine St., Wakefield, MA 01880) have similar switches for about half the price. Look for those described as "leaf" microswitches. The size of these switches and their terminals varies; so it is best to have them in hand before cutting the microswitch grooves in the wood block. Since the hinges on the Radio Shack switches (and probably most others) are a bit weak, they were strengthened with a matchhead size dab of silicone sealant.

The cable for each unit requires six conductors. We used two runs of four-conductor telephone cable with stranded wires, but you could use any small, flexible six-conductor cable.

The plug for the homebuilt Atari joystick is a DE9S socket from Jameco Electronics; it is a first cousin to the RS-232 socket used on many peripherals. The hand-wired version of this socket requires a separate plastic hood. The two plastic tabs on the hood stick out too far and must be filed down. The two clamping screws included with the hood are not needed for this project.

Parts List

Number Required	Description of Part	Suggested Supplier	Total Cost
5	Lever switch, #275-016	Radio Shack	$7.00
10 ft.	Telephone cable, #278-366	Radio Shack	1.20
1	Socket, 9 contact, DE9S (D-submin. connectors series)	Jameco	2.00
1	Hood, DE-9H (D-submin. hoods)	Jameco	1.20
1 sq. ft.	Hardwood		2.50
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Jameco Electronics
1355 Shoreway Rd.
Belmont, CA 94002
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Distinguishing plugs from sockets on computer equipment can be confusing. A connector is a plug if the small metal parts that conduct the electricity are metal prongs. It is a socket if these small parts are receivers for the prongs (note the letter S for socket in DE9S). Either type of connector may be mounted on a cable or in the electrical device itself. Be careful not to order the wrong type.

Electrical Wiring

Figure 4 is the electrical schematic for any Atari-type joystick. Each of the five microswitches is wired as a normally-open, momentary-contact switch. All of their common terminals (a small c identifies them) are connected and wired to pin 8. Each switch has its own wire on the normally open (n.o.) terminal.

To install the switches, solder two 3" pigtails of insulated wire to each switch. Telephone cable wire is excellent for this purpose. Use one wire color for all the common terminals and five different colors for the normally open terminals. Poke the wire through the holes. Position the switches with their hinges toward the center on the disk unit and down on the hand grip unit. The switches on the hand grip unit should just touch the rubber hose in its central position.

The switches were wedged into place in the grooves with flat slivers of wood from a popsicle stick and fixed in place

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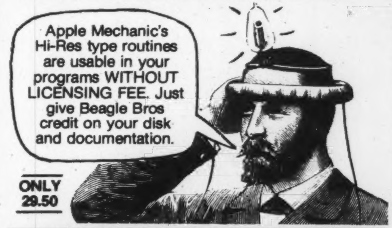
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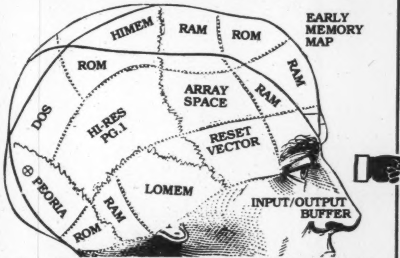

```
10   A$="RUQWLU RBOC YNTOOB C@OBDC":
     SPEED=180: VTAB 10: PRINT A$
20   FOR X=0 TO LEN(A$)-1: S=SCRN(X,19):
     COLOR=S+(S=12)-(S=13)-(SCRN(X,18)>10):
     PLOT X,19: NEXT X: GOTO 10
```

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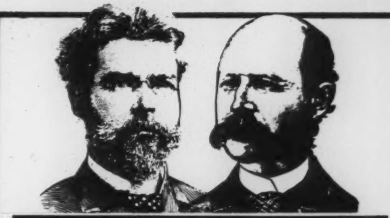

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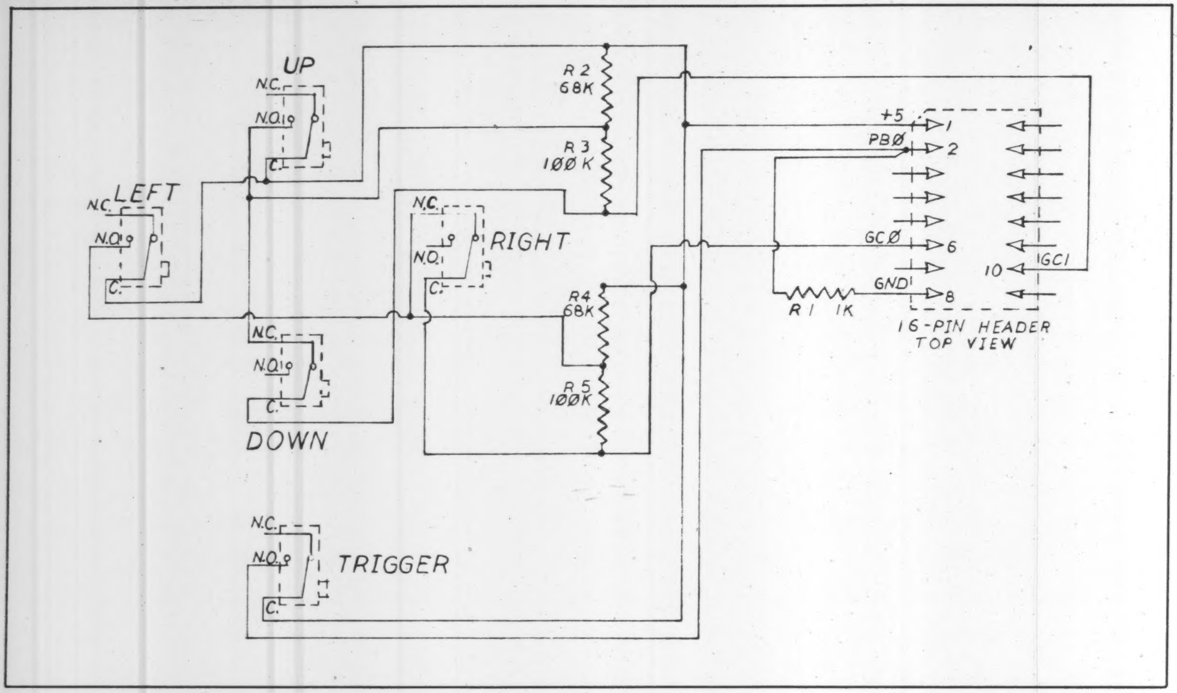

Figure 5. Microswitch Apple paddle.

with silicone sealant. Apply only a small amount of sealant and let it set for a few hours. (When you have completely checked out the joystick you can add more if necessary.)

Now turn the block over. Trim the wires short, but leave enough length to make the solder joints. Bring the main cable into the cavity and strip and tin all wires. Group all the common wires together, twist them, and solder the joint. Solder each of the five other two-wire joints, wrap each joint with a small piece of electrical tape, and press them all into the cavity.

Strip and tin all the wires on the socket end of the cable. Pass the cable through the hood and solder each terminal. It is easier to solder the socket if you clamp it upright in front of you in a small vise.

Checking The Circuits

You can use a multimeter set on a low ohms scale to check the wiring. Place one lead on socket terminal 8 and with the other lead move in turn to terminals 1, 2, 3, 4, and 6. On each terminal, press all the switches to be certain that the correct switch, and only the correct switch, shows continuity when pressed. Examine the socket solder joints for solder bridges and cold joints covered with dark resin. Make any necessary repairs. Don't assemble the connector until you are entirely satisfied with your work.

Test Run

Turn off your Atari. Plug in your new joystick and turn the system on again. If it doesn't start up in the normal way, turn it off immediately and recheck your work. Then run your favorite game to try out the unit. If you get crazy responses, you have probably wired some of the switches to the wrong connector pins.

Finishing Up

When the switches work correctly, you can put the finishing touches on the new joystick. The hand grip unit could probably use more silicone sealant on the switches and on the main cable where it comes out of the block. In addition, you can fill the bottom cavity with sealant, cover it with a piece of plastic, and clamp or weight it to a flat surface. After the sealant has set overnight, peel off the plastic, trim any excess sealant, and glue cotton felt to the bottom with contact cement.

The tipping disk unit deserves some personalizing touches. First secure the switches, main cable, and cavity as above. Then try out different combinations of thickness of the foam cross and height of the tipping post and shape of its top until you get a response you like. You can even do without the post altogether, or you can eliminate the foam by gluing the disk to the post with silicone sealant. Use whatever combination feels good and improves your speed. When you get the combination you like, glue the foam to the block and the tipping disk with contact cement.

Atari Joystick Circuit For The Apple

If you own an Apple computer you may want to make an Atari-type joystick for playing games that require only limited directions. "Snoggle" and many other arcade games are more enjoyably played with Atari-type joysticks than with Apple joysticks because the former have faster response. The resistance values of the two potentiometers in such a paddle, however, are limited to "full on," "average," and "full off."

The construction of this joystick for an Apple is almost the same as it is for the Atari systems, except that you will have to make the bottom cavity slightly larger. Figure 5 is the schematic for wiring the unit. Note that two of the switches (down and right) use the normally closed (n.c.) terminal. The resistors R2, R3, R4, and R5 can be placed on a postage stamp size piece of printed circuit board and hidden in the cavity in the block. Resistor R1 can be placed in the header plug so that only a four-wire cable will be needed.

This circuit works by mimicking a pot, using two resistors and two switches. If you don't press a switch, the game control inputs see the 68K resistors and read approximately 128. If you

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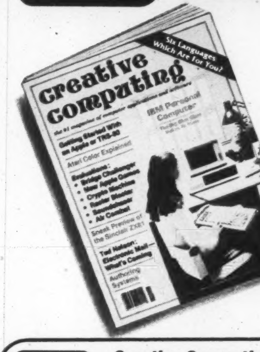

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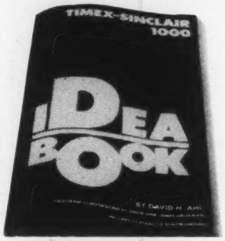

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Controller Corner, continued...

press the left (or up) switch, the game controls see zero resistance and read 0. If you press the right (or down) switch, the controls see 168K (68K plus 100K) and read full scale, 255.

Resistors R3 and R4 are not absolutely necessary, since the game controls read full scale when open, but it is easier to understand the circuit if they are shown. The stacked plug and socket we described in a previous article ("Multiple Socket Extensions," *Creative Computing*, May 1983) works very well with the Apple-adapted joystick.

Summing Up

You can build joysticks for the Atari in a home or school workshop. The materials will cost you less than the purchase of a commercial joystick, and the great advantage is that you can personalize your joystick for the exact feel and action you want.

Next month we will show you how to build a pair of race car steering wheels. Using these controls makes auto racing programs much more realistic and opens up the prospect of software for two-person competitive racing. ☐

Corrections

In our article, "Build an Airplane Controller For Your Computer" (*Creative Computing*, April 1983, pp. 244-259), the wiring shown in the schematic is inconsistent with the *A2-FS1 Flight Simulator* program mentioned in the article. The pot numbers are reversed. The unit can be made consistent with this program by reversing the wires going to pins 6 and 10 on the plug.

In "Rebuilding Game Paddles and Joysticks" (*Creative Computing*, February 1983, pp. 140-150), the last nine lines of Listing 1, Paddle Check Out, were omitted (page 149). These lines appear below:

```
296  GOTO 210
300  IF P0 > 127 THEN  VTAB 10: HTAB
     15: PRINT CL$
305  IF P0 < 128 THEN  VTAB 10: HTAB
     15: PRINT OP$
310  IF P1 > 127 THEN  VTAB 12: HTAB
     15: PRINT CL$
315  IF P1 < 128 THEN  VTAB 12: HTAB
     15: PRINT OP$
320  IF P2 > 127 THEN  VTAB 14: HTAB
     15: PRINT CL$
325  IF P2 < 128 THEN  VTAB 14: HTAB
     15: PRINT OP$
330  GOTO 210
999  END
```

We would like to thank the readers who pointed out these errors. We encourage you to keep writing to us with comments and questions.

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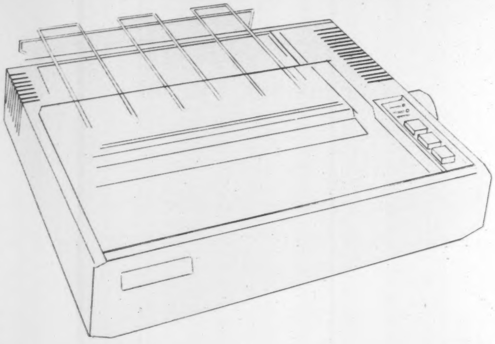


...print about printers...

John J. Anderson

Well folks, this is it. A monthly column devoted solely to printers and print products for microcomputers. It has been a while in coming, but we will now present an ongoing forum to discuss the state of the microcomputer printer art, as well as other developments concerning the processes involved in obtaining hard copy.

Creating a Forum

Because the situation with printers is so fast-changing and volatile, the occasional *Creative Computing* hardware review does not really provide the kind of continuity of market understanding that supports an educated buyer. Dramatic new features and substantial price cuts continually combine to make choosing a printer a tricky project. Perhaps through a column such as this, a better sense can be communicated of where the market stands and where it is headed.

Silencing the Scribe

Another advantage of this format is the opportunity to get some two-way communication going. It is important that individuals and companies that take issue with judgments presented here have a chance to respond. Here is a good example:

Anadex is still rather miffed over my treatment of their Silent/Scribe DP-9620A. In June I tried to make some amends, admitting I was wrong about the printer *requiring* a slotted printer stand, and noting that the unit was indeed the quietest impact printer we tested.

Kevin A. Mathews of Anadex was still not happy. "Concerning noise levels, the only proper way to measure the noise level of a dot matrix printer is in a semi-anechoic chamber," he said. An outside consulting firm came up with a figure of 55 dB, while we got a reading of 64 dB.

Well this has forced a re-evaluation of our noise level tests. I tried to be very clear in March that the numbers we indicated should be used for *comparison* only. And since I know of very few people who keep their printers in anechoic chambers, I do not feel too bad about our measurement standards, as they reflect *real world* conditions. Mr. Mathews questions whether we had the unit on a mat of acoustic foam. If he had read the piece closely, he would have learned that we did.

He also took issue with our labeling the 1.5K buffer of the unit as "surprisingly small." Certainly if the user has an external buffer of the kind we shall examine below, this spec will be of little concern. I still feel that 1.5K is a bit skimpy, but should note that the Anadex buffer can be expanded to 3K.

This is about all that remains to be said on the evaluation revision of the Anadex DP-9620A, except perhaps to reiterate that it is, indeed, an *excellent* printer, which I said originally. I remain convinced, however, that its price is less than fully competitive. If it listed for $1445 instead of $1845, it would have merited more than two stars.

And about this star system: is it worth the aggravation? I have dozens of letters taking me to task for my star ratings on various machines. Perhaps star ratings and noise level tests should be jettisoned entirely. It would certainly make my job easier. Let us know how you feel on these topics—and on any others you feel merit consideration.

Another advantage of a printer column as opposed to product reviews is the possibility of casually examining printer accessories. We shall make that a regular part of our discussion, rest assured, and shall begin on that task right now.

In the Buffer

Probably the most practical and potentially useful tool to add to your printer is a buffer. This, simply stated, is a type of RAM board used to temporarily store data for eventual output to a printer. By uploading data to a buffer, your micro will not have to wait for the printer to finish its job before returning to you for further commands. It can dump data to the buffer at a very efficient rate of speed, then return to your control, while the buffer then dumps data to the printer at whatever rate the printer can handle. The slower your printer, the more dramatic the time saving, of course.

If, like me, you generate many long documents for printout, waiting around for hard copy can be a big waste of time, even at 160 cps. I swear by the 64K in-line Microbuffer I am now using. With even the longest documents, it returns the computer to me after only a few minutes, and I can get back to work while my printer pumps out hard copy for the next half hour.

CLEAR
COPY
PAUSE

The Microbuffer In-Line, from Practical Peripherals.

Buffers come in many shapes, sizes, and configurations. The Microbuffer from Practical Peripherals is in a stand-alone box that can be attached to virtually any computer and printer. It can be expanded in increments of 64K up to 256K. I find 64K more than enough for my needs. Touch switches on the front of the unit allow the buffer to be cleared, multiple copies of documents to be printed, or to pause the upload. LEDs above the switches indicate their status.

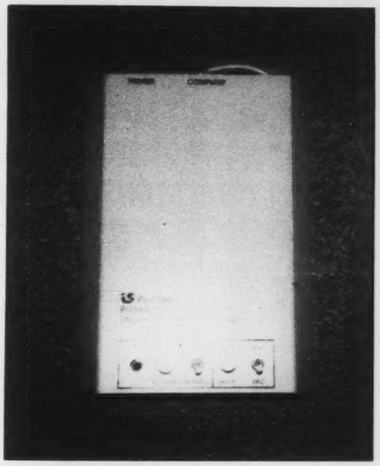
The Microbuffer In-Line is available in parallel and serial versions and lists for $299 (configured at 32K). In addition, as Kimberly Hibler emphatically pointed out to me, Practical Peripherals offers Microbuffer II, specifically for the Apple II. It can reside in any slot but 0, and includes special command codes and graphics functions. There is also Microbuffer/E for Epson printers. It sits on the back of your Epson and supports all Graftrax commands. Both models are also available in serial or parallel versions.

For more information, contact Practical Peripherals, Inc., 31245 La Baya Dr., Westlake Village, CA 91362. (213) 991-8200.

CLEAR
SKIP
FUNC
HOLD
PAUSE
COPY
RE PRINT
RESET
Angel
THE INTELLIGENT BUFFER
Ligo

The new Angel buffer.

Another, similarly priced unit is offered by Ligo Research in Illinois. The Angel Buffer not only offers all of the features of the Microbuffer, but will accept serial input for parallel output or parallel input for serial output. This handy feature would have been invaluable to us when we were testing over a dozen very varied printers last March. If you have parallel vs. serial compatibility problems with your computer and printer, this product can solve them while providing the convenience of a print buffer.



The Pipeline buffer.

The Angel unit can be upgraded to a maximum of 128K, but is shipped with 64K. For $295, that is a good buy. As it is brand new, we have yet to see a unit at the lab. I cannot, therefore, make a judgment on the Angel buffer, other than to say that on paper, it sounds pretty good. Ligo Research Inc., 396 E. 159th St., Harvey, IL 60426. (312) 331-8797.

One buffer we *have* had a chance to play with here is the parallel Pipeline Random Access Printing Buffer, from Interactive Structures (the people who brought Apple owners the Pkaso printer interface). This is touted as the first "intelligent" microcomputer buffer device. In addition to conventional "dumb" buffering, a "random access printing" feature is offered, wherein labelled data can be stored in separate buffer compartments, then printed in any specified order any number of times.

This capability makes it easy to combine output from different programs—text with spreadsheet data, for example, perhaps augmented by graphics charts, directly from the buffer. Even Pipeline commands themselves can be stored in Pipeline "buckets" to control in turn other Pipeline operations. The unit comes with 8K, but is expandable to 128K. I should think that more than 8K would be required for any truly practical "intelligent" buffering.

"Buffer buckets" certainly constitute a unique approach to integrated output flexibility, and I suspect we will see other "intelligent" buffers springing up soon.

The Pipeline buffer with 8K lists for $195. Contact Interactive Structures Inc., 146 Montgomery Ave., Bala Cynwyd, PA 19004. (215) 667-1713.

Another unit we like very much is the Quadram MicroFazer (see complete review on page 64, March '83 issue).

Twin Stars from Micronics

The low end of the printer market is now teeming with so-called "fully-featured" machines. By "fully-featured, most manufacturers mean machines with 80- or 132-column capability, tractor or friction feed, and an acceptable dot matrix print quality, with true descenders at quite a low cost.

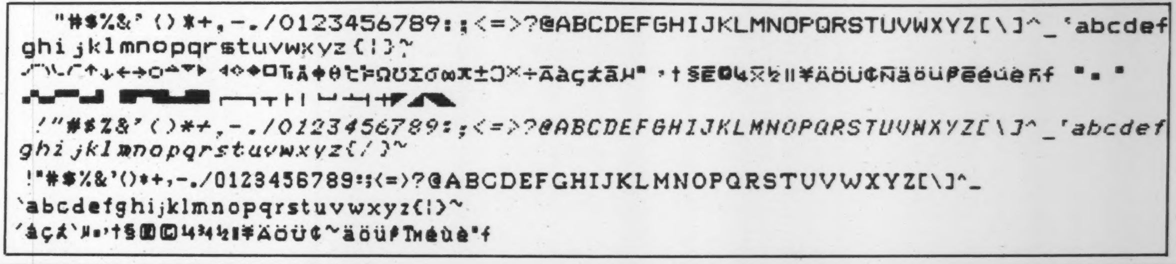
One of the recent entries to this arena is the Gemini-10 from Star Micronics. It is an 80-column 10" carriage machine with a pleasing Epson-like 9 X 9 dot matrix font, capable of producing proportional, expanded, and italicized characters in three pitches. It features dot-addressable graphics capability as well. The claimed speed of the unit is 100 cps, with a feed speed of 10 lines per second. In actual use, I calculated the overall speed of the printer at about 65 cps, which is not bad at all for a printer of this category. The printer provides for single sheet friction feed and is relatively quiet.

In about a week of hard use, the Gemini-10 held up very well. Its companion 15 1/2" carriage 132-column model, the Gemini-15, was in use at a sister publication for about the same length of time, and also performed quite well. The larger machine is also capable of bottom-loading, which its smaller brother is not.

Both machines come with Centronics parallel interfacing standard. Serial interfacing is available as an option.

It is really unfair to fault low-end printers for being "plasticky," as was pointed out repeatedly to me after the March printer round-up. If not for the miracle of plastics (shades of "The Graduate"), low-end printers would not exist at such low prices. Still, it must fairly be said that the Gemini-

Gemini-10 print sample.



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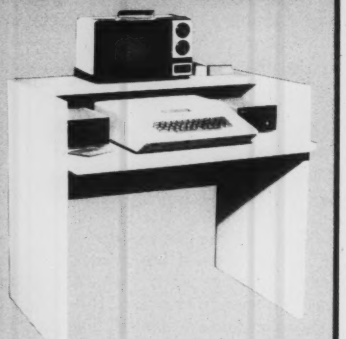
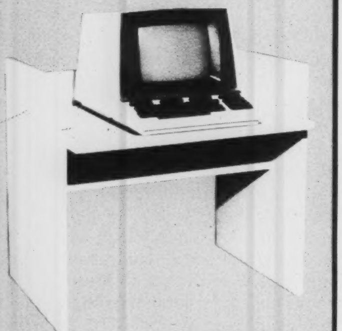
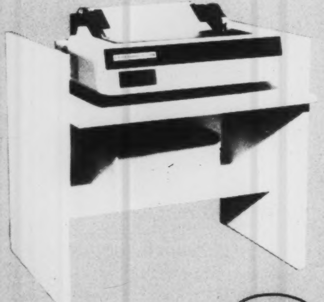
Its inevitable!







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CIRCLE 241 ON READER SERVICE CARD

Printers, continued...

10 falls in the category of "very plasticky" printers, not very likely to graciously survive being knocked off a desk and onto a concrete floor. I am not faulting the printer on this account; I am merely warning owners and potential owners not to drop the machine onto a concrete floor. (It shouldn't be so difficult to avoid, except on the premises of and under the conditions prevailing at *Creative Computing*.)

The Gemini printers are capable of all the print modes we have come to expect: super/subscript, underlining, backspacing, double strike and emphasized. Star Micronics claims a mean time between failure rate of 5 million lines, and a printhead life of 100 million characters. They offer a 90-day warranty on ribbon and printhead, along with a six-month warranty on the rest of the machine.

In addition, the machines come with a standard buffer of 2.3K, expandable to 6.3K. A buffer of that size is quite practical. Are you listening, Anadex?

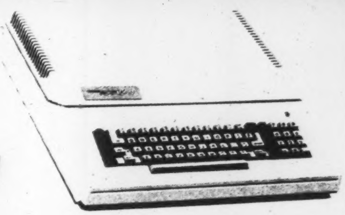
The Gemini-10 printer.

These facts are especially impressive when you consider that the list price of the Gemini-10 is $399, and of the Gemini-15, $649. I have noticed substantial discounts on these prices in several computer magazines, so shop around.

Both machines qualify for another category of mine: Epson look-alikes. They look, sound, feel, and operate like Epsons, and the controls on the machines are nearly identical with those on the MX-80 and MX-100. One gets the feeling that they must be assembled down the block from the Epson plant in Osaka.

But if any printer design should be copied, it is the Epson. And Star Micronics has done a very good job, and managed to price it even lower. If you are looking for a low-end printer, have a look. Star Micronics Inc., 1120 Empire Central Pl., Suite 216, Dallas, TX 75247. (214) 631-8560. ☐

SNAVE SYSTEMS



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CIRCLE 193 ON READER SERVICE CARD

cart...apple cart...apple

Stephen Arrants

This month's column will be a bit different from recent "Apple Carts." No applications this month. Instead, we'll look at some new products for the most forgotten Apple, the Apple III, talk about the Apple IIe, review two books and offer a program that will let you peek inside the heart of your Apple.

The success of the Apple II was due less to the genius of Jobs and Wozniak than to the gigantic software base quickly built around the machine. The number of programs, the variety of peripherals and accessories and the information, support and dealership network grew rapidly and guaranteed success for the Apple II. There was always someone or someplace to fall back on for help and guidance.

When Apple introduced the Apple III, it was to fill the perceived need for a "business" machine to complement the II—the "hobby" machine. Sales were not as large as expected for several reasons. First, the applications software base wasn't very large. Second, user information was almost non-existent. Some users were turned off by problems caused by running II software (or rather by the software *not* running) on the III.

And who can forget drop-testing the III? Very few users could put up with a machine that had to be lifted and dropped a few inches to reseat the ICs. Apple has improved on the III, made more technical information available to users and tightened quality control which seems to indicate that the III is here to stay. Certainly peripheral manufacturers are beginning to believe that the Apple III is a viable computer. The products introduced at the Anaheim Applefest attest to this.

Need More Storage?

One complaint about the III was the lack of high-capacity disk storage at a reasonable price. Micro-Sci produces three 5-$^1/_4$" drives that are fully compatible and relatively inexpensive. The A3 replaces factory drives, giving 140K storage. The A73 more than doubles capacity at 286K. If you need more storage, the A143 has a storage capacity of 573K. These drives may be daisy-chained and used in any combination.

If you need an 8" drive, say, for running the industry standard CP/M, Burtonix markets the Floppycard III. Allowing the III to handle single- and double-density 8" disk drives and the Amlyn Cartridge Floppy drive, this card is compatible with Apple III Basic, Pascal, and CP/M. Up to 4.4Mb of storage is accessible. Also offered is the Model A#-121, which includes two double-sided double-density drives and the interface card, and the Model A#-122 offering the Amlyn cartridge system.

Need even more storage? Corvus Systems has a new Winchester system for the III. The Model 6 offers an unformatted capacity of 6.7Mb, 5.7Mb formatted. The Model 11 has a capacity of 14.0Mb unformatted, 12.1 Mb formatted. If you really need storage space, the Model 20 allows 21.0Mb of unformatted storage and a gigantic 18.4Mb of formatted storage. Definitely not for your average user!

I/O

One area usually neglected is printer cards. For handling Centronics type printers, Burtronix has developed a card that can handle full-color graphics dumps to the IDS Prism printer. Up to now, the Pkaso III card from Interactive Structures was the only card capable of performing this magic.

Do you need a parallel card without graphics, but with lots of power? A new board from SSM, the APIO-III has both serial and parallel outputs. It also boasts RAM/ROM capability and it will let you attach almost anything to your III. SSM also has the ASIO-III, a serial-only card with the same features. Both of these boards leave the internal RS-232 port of the Apple III free for other uses.

For users seeking a parallel card with an on-board buffer, Wesper Micro Systems offers the Wizard-BPO board, which has both parallel and serial outputs and a 16K (expandable to 32K) buffer.

Two new plotters were introduced at the show. The Sweet-P from Enter Computer is low cost and high quality. The trade-off is that pens must be changed manually.

At a higher cost, the Model 84 from

burtronix printercard III

Sample output from the Burtronix Printercard III.

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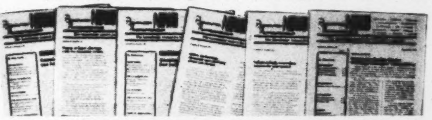

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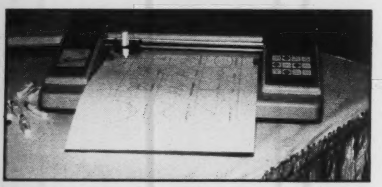
CalComp is fast, quiet, and extremely powerful. It can change automatically up to eight pen colors while plotting. Consider this model if your needs include detailed scientific or engineering applications.

Southern California Research Group now provides Extend-A-Slot and Switch-A-Slot for the Apple III. Extend-A-Slot is a ribbon cable and edge connector combination that allows signals from the III to be brought outside the case for easy access. Switch-A-Slot, using a switched external card slot, increases the number of available slots by four.



The Sweet-P plotter.

Afraid of thieves walking away with your precious machine? The Anchor Pad from Anchor Pad International may help you sleep more soundly. You can lock your III to any large, flat object for security. Choose the spot carefully, however. Once the base is installed, it is there *forever.*

If you are tired of running "serious" programs on the Apple III and want an exciting session of *Choplifter* or *Wavy Navy,* Micro-Sci has the Gameport III. You can now use Apple II game controllers and game software on the III.

Apple III Software

Software selections were, as usual, scant. Apple III owners have gotten used to this. With such a large market, you would think that software publishers would write for the Apple III.

Applied Technology has published *Versaform,* a form generator for businesses.

Copy II Plus, one of the most popular programs for the Apple II now can be used on the Apple III. Central Point Software states that the package will back up almost all Apple III software.

Catalyst and *Discourse* from Quark Engineering are two utility packages for Apple III Profile hard disk users. *Catalyst* allows booting from Profile, and lets you switch from one application to another with a single keystroke. *Discourse* stores printer output on the Profile, letting you use the computer for other work.

Also present were the Apple III'rs, an excellent user group. This is the place to find information on the III. If you are serious about the III, contact this group.

IIe Upgrades

If you bought an Apple IIe with the Revision A motherboard, you won't be able to take advantage of the 560 by 190 super high-resolution graphics. Since the software needed to generate these graphics isn't available, the revision is unnecessary at present. If you really want a Revision B motherboard, your dealer will install it for free. There's a catch, of course. You must prove that you have Apple's 80-column Extended Memory Board to get the free upgrade. In the future, owners will have to pay for labor charges, but not for parts.

Some Apple dealers are offering a special "trade-up" to the Apple IIe. For about $500, you can walk in with an Apple II or II+ and walk out with a IIe. Is it worth it? If you have a lowercase adapter, an 80-column card, and other enhancements, the trade-up may not be worth it, but if you're like me, you want the newest model. I had an Apple II with non-Autostart ROM. I removed all my enhancements and improvements, sold them to other Applers and traded. So, for about $250 I had a brand new Apple IIe complete with manuals and warranty. What happened to my old Apple? It was cleaned and sold to someone wanting an Apple at a low price.

How is the IIe selling? Apple reportedly is producing about 40,000 units per month. Waiting time at some dealerships is *one month or longer.* Obviously Apple has a monster machine on its hands. Almost totally hardware and software compatible with earlier II models, the IIe has dropped right into a well-defined, ready-made market. So kudos to Apple for doing an excellent job.

Tutorials And Books For The Apple

Apple also deserves congratulations for changing the instruction and reference manuals. The production and design of the new series is first-rate—something rare in the world of microcomputing. These are the first manuals that recognize that not everyone wants to be a "techie." *The Applesoft Tutorial* has been rewritten, and a tutorial disk is included.

The Applesoft Basic Programmer's Reference Manual offers excellent programming techniques useful to both the beginner and the long-time user. I recommend getting it even if you don't own an Apple IIe. Much of the material is useful for II+ owners.

There are probably more third-party books published for Apples than for any other micro. You can get a book on data files, game design, DOS, or meditating with the Apple (I'm not kidding). Some are helpful; most are confusing; and a very few are worth the money spent.

Apple II User's Guide (Osborne/McGraw Hill) by Lon Poole with Martin McNuff and Steven Cook is an extremely valuable book for anyone using an Apple. This should be the first thing you buy after getting the Apple. Don't even buy software. This book assumes that you have no knowledge of computing and leads you through concepts such as programming in Basic, graphics and sound, disk organization, and using the Monitor. Included is a glossary of Basic statements, functions and error messages. An excellent set of appendixes rounds out this book.

One book no serious Apple user should be without is *What's Where in the Apple—A Complete Guide to the Apple Computer* by William F. Luebbert, published by Micro Ink (Chelmsford, MA). This book is *not* for the beginner. You'll need some prior programming experience to understand all the topics Dr. Luebbert covers. In addition to covering PEEKs, POKEs, CALLs, and other difficult concepts, *What's Where in the Apple* lists and describes more than 2000 memory locations, including the names and locations of different Monitor, DOS and Basic routines. It's expensive ($24.95), but as you gain more programming experience, you will find this an invaluable resource. One note—with the introduction of the Apple IIe, some sections of *What's Where in the Apple* are incorrect. Until a revision comes out, be careful what you PEEK, POKE or CALL.

Short Program

Well, that's about it. To wrap things up, here is a short program that doesn't seem to do much. Actually, it is very powerful. This program will let you look at each RAM location in the Apple. To see what might be in memory, run it after running other programs. Try it after RUNning or BRUNning programs from the System Master. A lot of what you'll see will look like garbage, but if you look closely, you will recognize parts of programs, DOS commands, and other interesting tidbits. Don't worry about running this program—you can't crash

Listing 1.

```
10  HOME
20 K = 65535:  REM    K = TOTAL RAM IN YOUR SYSTEM
30   FOR LOC = 0 TO K
40   PRINT  CHR$ ( PEEK (LOC));
50   NEXT LOC
```

the system by just looking around. Remember to set K to the total amount of RAM present in your Apple. Just multiply 1024 by the number of "K" (48 or 64), subtract one and what you have is the value for K.

Next month, more new products, reviews of some utilities you should have, and a simple method of recovering lost files.

A special thanks to Paula and William Purpura for providing information from the Anaheim Applefest. ☐

Firms Mentioned In This Column

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2411 West LaPalma Ave.
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2158 South Hathaway St.
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Quark Engineering
1433 Williams
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Denver, CO 80218
(303) 399-1096

Southern California Research Group
P.O. Box 2231
Goleta, CA 93118

SSM
2190 Paragon Dr.
San Jose, CA 95131
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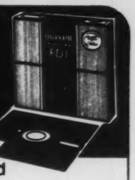

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outpost : atari

John J. Anderson

The baseball season is in full swing, so to speak, and no one here is surprised about the Mets, but I wish the Yankees would get their act together. It is not so much the pennant hopes going up in smoke, as the thought of seeing Martin leave in tears yet again. It makes me sick to my stomach. I expect next season Steinbrenner will bat clean-up.

Last time around I intimated that this month's column would bear some very good news for Atari computer fans. These loyalists, I dare say, have been somewhat comparable lately to baseball fans in Muddville. That means keeping up the enthusiasm despite the nasty strikeouts.

If you have been poised on the edge of your seat, racked with concern, anxious, sweaty palmed, waiting for a homer in home computers from Atari, you won't be disappointed. Yessir, folks, there will be a new beginning, and at least some of the facts are in.

The Atari 1200 has been benched. Riddled with compatibility problems, beset by severe video signal woes, a gaggle of petty compromises, and generally reviled by the community of Atari users, production of the 1200 XL machine was suspended some time ago pending a "policy reexamination." Happily, that reexamination resulted in Atari pulling the 1200 XL off the market entirely and permanently. The last of the machines are now on the shelves.

In showing the courage to admit their sizable and costly error and to choose a new lineup, Atari has shown some class and the first signs of intelligent life we have seen in some time. Let's hope they keep it up.

In the interest of good will, I won't rehash my beefs about the 1200. It is gone; it is of the past. Let's put it behind us.

And let's take a fresh look at the future. After a rather humorous, albeit bizarre detour, Atari home computers are moving in the right direction once again. That is moving ahead, especially in terms of competitive pricing, while wisely leaving some proven formulas untampered with. Bravo, boys. Here is the roster, as of press time:

- *The Atari 600 XL.* Yes, you read it right. The Atari 600 lives. And it is looking very good. With 16K expandable to 64K, a full stroke keyboard, and built-in Atari Basic, the machine has a promising future. Especially because it will use the original operating system that made its predecessors famous—that means it will boot *all* existing Atari software within existing memory constraints. And I assume it will put out the same clear, clean video that the 400 and 800 machines have always delivered to any TV or monitor. Then do a double take at the price: $199 list.
- *The Atari 800 XL.* This machine will have 64K standard, and also use the old OS, as do all the new machines from Atari. And, using its expansion port, memory can be expanded to a whopping 192K. Not too many details have been made available concerning the expansion capability, but already there is talk of an expansion chassis to hold 80-column cards and the like. And jumping jiminy, the list price is only $299.
- *The Atari 1400 XL.* This is the replacement machine for the ill-fated 1200 with most of the grievances redressed. The compatible operating system will be there, along with hardware expansion capability, and even (hold on to your hats) a built-in modem! It must sound as if I am making this up, but it is the truth; there will even be an onboard speech synthesis chip. Jeepers. For a list price of $499, I would have settled for a measly parallel port.
- *The Atari 1450 XLD.* Nothing more than a *1400 XL* for your $799 list, except for the built-in low-profile $5^1/_4''$ disk drive. Atari Home Computer Division may have been down, but is not out of the game yet. Not by a long shot. Okay, it is quite conceivably the bottom of the ninth, with two out. But Casey is on base and the tying run is at the plate.
- *The Atari 1050 Disk Drive.* This is the stand-alone version of the drive built into the *1450 XLD*. It is a half-height drive. Using the new DOS 3.0, it is capable of more than 150K of storage on a single disk. At the same time, it remains completely compatible with all existing 2.0 disk software. Pricing not available at press time.
- *The Atari 1027 Printer.* Not much more to say about this now other than that it is a letter quality printer for $399.

Now don't you agree that news like this is good news indeed?

Oh yes, and just a little bit more to brighten your day—your third-party cartridges *will fit* in these new machines. It just might be that Atari has come around.

We will soon find out.

Our guest tutorial this month is from Fred Pinho, author of the game program "Medieval Combat," which appeared in the May 1983 issue of *Creative.* Fred is very knowledgable about Atari memory conservation, among other Atari topics. In the balance of this installment of the Outpost, he will provide insight into a very powerful technique for compacting data and saving a great deal of annoying load time.

Before I surrender the rostrum, I must thank Alfred Publishing, and specifically Joseph Cellini, for allowing us to reproduce Appendix B from the booklet "Understanding Atari Graphics." This is the only reference I have seen that provides a keypress to ATASCII chart, which is necessary to

At last, the first home video joystick that puts the firing button where it should have been in the first place.

The new Triga-Command is like no other home video joystick controller you've ever used.

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TRIGA COMMAND

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take advantage of Fred's data technique.

And so here is Fred. If you wish to correspond directly with him, his address is 676 Rollingwood Way, Valley Cottage, New York 10989.

* * *

One straightforward way to load numerical data into a computer is to READ the data value and POKE it into the desired memory location. An example of this method is shown in Listing 1. Though easy to program, it is memory inefficient and runs relatively slowly. This method requires anywhere from three to five bytes for each data number stored. Why? Each number given *in the program* requires one to three integers plus a comma in the DATA statement. This, and the memory location used for final storage, add up to three to five bytes.

If you run the program in Listing 1, you will see how slow this procedure can be (87 seconds to load 6000 bytes). The same thing is accomplished by Listing 2 in only two seconds! I once wrote a program that required about 9400 numbers to be loaded for use in a graphics routine. This took forever to perform (about five minutes). It also consumed excessive amounts of precious memory (even 32K can be used up quickly). I was able to keep memory usage to this level only because some of the data were repeated and thus did not have to be listed in DATA statements. By contrast, the method shown in Listing 2 cut the loading time to 25 seconds and saved roughly 8K bytes of memory.

The method shown in Listing 2 depends on two techniques. First, represent the number by its graphics equivalent rather than by the actual numerals. This reduces memory use by eliminating the comma in the DATA statement and cutting the bytes used to represent the number in the DATA state-

Listing 1. Loading time about 87 seconds.

```
1000 POKE 106,PEEK(106)-24:GRAPHICS 0:D=
PEEK(106)*256
1010 FOR X=1 TO 6000 STEP 100:RESTORE
1020 FOR Y=0 TO 99:READ Z:POKE D+X+Y,Z:N
EXT Y
1030 NEXT X
1040 DATA 65,66,65,66,65,66,65,66,65,66,
65,66,65,66,65,66,65,66,65,66,65,66,65,6
6,65,66,65,66,65,66,65,66,65,66
1050 DATA 65,66,65,66,65,66,65,66,65,66,
65,66,65,66,65,66,65,66,65,66,65,66,65,6
6,65,66,65,66,65,66,65,66,65,66
1060 DATA 65,66,65,66,65,66,65,66,65,66,
65,66,65,66,65,66,65,66,65,66,65,66,65,6
6,65,66,65,66,65,66,65,66,65,66
```

Listing 2. Loading time about 2 seconds.

```
1000 DIM A$(6000),B$(100)
1010 GRAPHICS 0:FOR X=1 TO 6000 STEP 100
:RESTORE
1020 READ B$:A$(X,X+99)=B$
1030 NEXT X
1040 DATA ABABABABABABABABABABABABABAB
ABABABABABABABABABABABABABABABABABABAB
ABABABABABABABABABABABABABABABABAB
```

Keypress to ATASCII chart.

Decimal Code	Keystrokes to Produce Character	Mode O ATASCII Character
0	CTRA-,	♥
1	CTRL-A	├
2	CTRL-B	▕
3	CTRL-C	┘
4	CTRL-D	┤
5	CTRL-E	┐
6	CTRL-F	╱
7	CTRL-G	╲
8	CTRL-H	◢
9	CTRL-I	▗
10	CTRL-J	◣
11	CTRL-K	▝
12	CTRL-L	▘
13	CTRL-M	▔
14	CTRL-N	▁
15	CTRL-O	▖
16	CTRL-P	♣
17	CTRL-Q	┌
18	CTRL-R	─
19	CTRL-S	┼
20	CTRL-T	●
21	CTRL-U	▄
22	CTRL-V	▎
23	CTRL-W	┬
24	CTRL-X	┴
25	CTRL-Y	▌
26	CTRL-Z	└
27	ESC\ESC	␛
28	ESC\CTRL--	↑
29	ESC\CTRL-=	↓
30	ESC\CTRL-+	←
31	ESC\CTRL-*	→
32	SPACE BAR	Space
33	SHIFT-1	!
34	SHIFT-2	"
35	SHIFT-3	#
36	SHIFT-4	$
37	SHIFT-5	%
38	SHIFT-6	&
39	SHIFT-7	'
40	SHIFT-9	(
41	SHIFT-0	)
42	*	*
43	+	+
44	,	,
45	-	-
46	.	.
47	/	/
48	0	0
49	1	1
50	2	2
51	3	3
52	4	4
53	5	5
54	6	6
55	7	7
56	8	8
57	9	9
58	SHIFT	:
59	;	;
60	<	<
61	=	=
62	>	>
63	SHIFT-\	?
64	SHIFT-8	@
65	A	A
66	B	B
67	C	C
68	D	D
69	E	E
70	F	F
71	G	G
72	H	H
73	I	I
74	J	J
75	K	K
76	L	L
77	M	M
78	N	N
79	O	O
80	P	P
81	Q	Q
82	R	R
83	S	S
84	T	T
85	U	U
86	V	V
87	W	W
88	X	X
89	Y	Y
90	Z	Z
91	SHIFT-;	[
92	SHIFT-,	\
93	SHIFT-+	]
94	SHIFT-*	^
95	SHIFT—	—
96	CTRL-.	♦
97	a	a
98	b	b
99	c	c
100	d	d
101	e	e
102	f	f
103	g	g
104	h	h
105	i	i
106	j	j
107	k	k
108	l	l
109	m	m
110	n	n
111	o	o
112	p	p
113	q	q
114	r	r
115	s	s
116	t	t
117	u	u
118	v	v
119	w	w
120	x	x
121	y	y
122	z	z
123	CTRL-;	♠
124	SHIFT =	|
125	ESC\CTRL-< or ESC\SHIFT-<	↖
126	ESC\BACK S	◀
127	ESC\TAB	▶

Keypress to ATASCII chart, continued.

Decimal Code	Keystrokes to Produce Character	Mode O ATASCII Character
128	(▲) CTRL-,	♥
129	(▲) CTRL-A	┣
130	(▲) CTRL-B	▕
131	(▲) CTRL-C	┛
132	(▲) CTRL-D	┫
133	(▲) CTRL-E	┓
134	(▲) CTRL-F	╱
135	(▲) CTRL-G	╲
136	(▲) CTRL-H	◢
137	(▲) CTRL-I	▗
138	(▲) CTRL-J	◣
139	(▲) CTRL-K	▝
140	(▲) CTRL-L	▘
141	(▲) CTRL-M	▔
142	(▲) CTRL-N	▁
143	(▲) CTRL-O	▖
144	(▲) CTRL-P	♣
145	(▲) CTRL-Q	┏
146	(▲) CTRL-R	━
147	(▲) CTRL-S	╋
148	(▲) CTRL-T	●
149	(▲) CTRL-U	▄
150	(▲) CTRL-V	▎
151	(▲) CTRL-W	┳
152	(▲) CTRL-X	┻
153	(▲) CTRL-Y	▌
154	(▲) CTRL-Z	┗
155	(▲) RETURN	(EOL) RETURN
156	ESC\SHIFT-BACK S	↑
157	ESC\SHIFT->	↓
158	ESC\CTRL-TAB	←
159	ESC\SHIFT-TAB	→
160	(▲) SPACE BAR	Space
161	(▲) SHIFT-1	!
162	(▲) SHIFT-2	"
163	(▲) SHIFT-3	#
164	(▲) SHIFT-4	$
165	(▲) SHIFT-5	%
166	(▲) SHIFT-6	&
167	(▲) SHIFT-7	'
168	(▲) SHIFT-9	(
169	(▲) SHIFT-0	)
170	(▲) *	*
171	(▲) +	+
172	(▲) ,	,
173	(▲)-	-
174	(▲) .	.
175	(▲) /	/
176	(▲) 0	0
177	(▲) 1	1
178	(▲) 2	2
179	(▲) 3	3
180	(▲) 4	4
181	(▲) 5	5
182	(▲) 6	6
183	(▲) 7	7
184	(▲) 8	8
185	(▲) 9	9
186	(▲) SHIFT-:	:
187	(▲) ;	;
188	(▲)<	<
189	(▲) =	=
190	(▲) >	>
191	(▲) SHIFT-/	?
192	(▲) SHIFT-8	@
193	(▲) A	A
194	(▲) B	B
195	(▲) C	C
196	(▲) D	D
197	(▲) E	E
198	(▲) F	F
199	(▲) G	G
200	(▲) H	H
201	(▲) I	I
202	(▲) J	J
203	(▲) K	K
204	(▲) L	L
205	(▲) M	M
206	(▲) N	N
207	(▲) O	O
208	(▲) P	P
209	(▲) Q	Q
210	(▲) R	R
211	(▲) S	S
212	(▲) T	T
213	(▲) U	U
214	(▲) V	V
215	(▲) W	W
216	(▲) X	X
217	(▲) Y	Y
218	(▲) Z	Z
219	(▲) SHIFT-,	[
220	(▲) SHIFT-+	\
221	(▲) SHIFT-.	]
222	(▲) SHIFT-*	^
223	(▲) SHIFT–	_
224	(▲) CTRL-.	◆
225	(▲) a	a
226	(▲) b	b
227	(▲) c	c
228	(▲) d	d
229	(▲) e	e
230	(▲) f	f
231	(▲) g	g
232	(▲) h	h
233	(▲) i	i
234	(▲) j	j
235	(▲) k	k
236	(▲) l	l
237	(▲) m	m
238	(▲) n	n
239	(▲) o	o
240	(▲) p	p
241	(▲) q	q
242	(▲) r	r
243	(▲) s	s
244	(▲) t	t
245	(▲) u	u
246	(▲) v	v
247	(▲) w	w
248	(▲) x	x
249	(▲) y	y
250	(▲) z	z
251	(▲) CTRL-;	♠
252	(▲) SHIFT-=	|
253	ESC\CTRL-2	↰ (Buzzer)
254	(▲) ESC CTRL-BACK S	◀ Delete character
255	(▲) ESC\CTRL->	▶ Insert character

Table 1.

Byte	Contents
1	Contains the number 129 which specifies that the variable is a string.
2	Variable Number (0 to 127). These numbers are assigned in sequence as the variables are declared in the program.
3,4	These bytes give the offset from the beginning of the string/array table to the first memory location of the string variable. The bytes are stored with the least significant byte first (as are the following pairs). Thus to obtain the offset, multiply the contents of location 4 by 256 and add the contents of location 3.
5,6	Contains the number of the last string location that has had data actually written to it.
7,8	Contains the maximum length of the string as given in your DIM statements.

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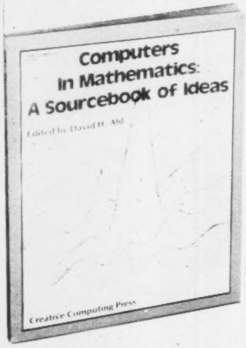

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Outpost: Atari, continued...

ment to one. It also allows you to pack more data into each program line. This saves additional memory by eliminating additional line numbers and DATA statements.

Entering the graphics symbols is more time-consuming than typing the number. However, it is not too difficult if you use the tables shown here. In these tables, each key stroke required to generate the appropriate symbol is detailed. Be careful to observe the following notes otherwise you will find errors in your data.

There is one limitation to this method; you can't use it directly for the values of 34 and 155. These ATASCII values are the codes for quotation marks and for the RETURN function. You can't type these directly into a string because the Atari will treat them as string and line terminators. The easiest way to get around this problem is to load a space from a DATA statement into the desired string location. Once the string has been accepted by Basic, the string can be modified via the CHR$ function to add the desired value. As long as you don't PRINT the modified string, all is well. For example:

```
1000 DIM A$(10)
1010 READ A$
1020 A$(6,6)=CHR$(34)
1030 DATA AXY*+ CD/P
```

The second technique, which speeds up program execution, is simply the reading of a whole string of characters at once rather than byte by byte using READ and POKE commands.

After you have loaded your data as strings, there are many things you can do that are not immediately obvious. Strings are a very economical form of data storage. Consider that each value in an array or matrix consumes six bytes of memory while string storage takes one byte. If you are working with large amounts of data, the savings can be considerable. For example, a 20×20 matrix would normally require 2646 bytes for data storage. Remember that Atari Basic always assigns a zero element to an array or matrix so that 20×20 is really 21×21. The same amount of data could be stored in a string in 441 bytes. Of course, the saving in memory is not quite that good since the string technique requires more complex code than direct use of matrices. You will come out way ahead, however.

As it stands, this technique can only handle data in the range of 0-255. This is not a severe limitation since these values are the ones required for graphics work. With a little further programming effort, two byte string values can be stored. These would provide a data-value range of zero to 65,535.

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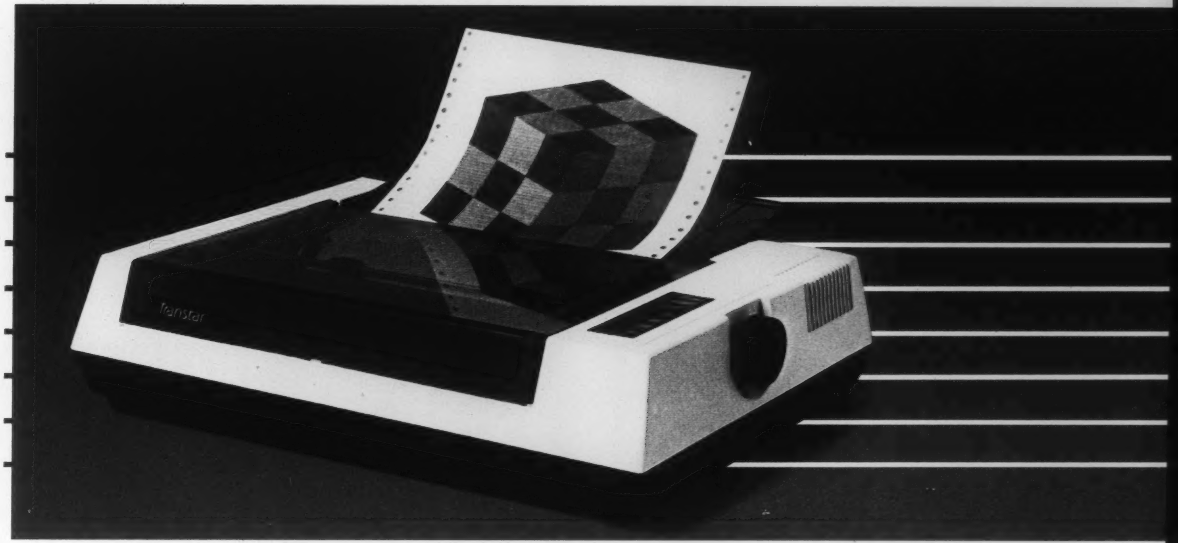

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Outpost: Atari, continued...

How does one access a string as if it were a matrix? It isn't too diffcult. Assume an R by C matrix (R=rows; C=columns). Remember that we actually have $R+1$ rows and $C+1$ columns due to the zero elements of the matrix. What string position corresponds to the matrix element (X,Y)?

String Position $= X*(C+1)+Y+1$

Note that the above is for single-byte numbers. A similar analysis can be developed for double-byte numbers. The data value stored in the string can then be recovered via the ASC function. As an example, for a 2 x 2 matrix where the (1,2) element is desired:

```
1000 DIM MATRX$(9)
1010 MATRX$="5A6D%+7Z$":C=2
1020 X=1:Y=2:S=X*(C+1)+Y+1
1030 MATRX=ASC(MATRX$(S,S))
```

A very powerful technique, using "data strings," involves forcing the computer to place the desired string data into a location specified by the programmer rather than by the computer. This is not an easy task, but it can be done. To accomplish it requires a knowledge of how the Basic system keeps track of strings. Basic sets aside two tables (among others) in memory called the Variable Value Table (VVT) and the String/Array Table (SAT). The location of the VVT is stored in memory locations 134 and 135 and is found by the following: 256*PEEK(135) + PEEK(134). Eight bytes are reserved for each variable declared in the program (variables include scalar, array and string variables). For a string variable, the bytes are assigned as shown in Table 1.

The String/Array Table is an area in memory reserved by the computer to accommodate string and array data. The size of this table is determined by the programmer through his dimension statements. This table normally resides in memory above the Basic program.

With the above information in mind, we can proceed to bend the computer to

OK, who erased my spinach surprise recipe?

Program Details.

1. *Listing 1.*	
Lines	
1000	Lower RAMTOP and issue Graphics call to have the Atari relocate the display list and data below the new RAMTOP.
1010-1030	READ each data value and POKE into a specified location above RAMTOP.
1040-1060	Numerical data.
2. *Listing 2.*	
Lines	
1000	Dimension the final data string (A$) and a smaller holding string (B$).
1010	Sets up loop to RESTORE the DATA line 60 times so that it can be reread.
1020	Reads DATA line in B$ and inserts B$ into A$.
1030	End of loop.
1040	DATA line containing data in form of graphics characters.
3. *Listing 3.*	
Lines	
10-20	Dimension of data strings.
30	Graphics call. Calculation of address of Variable Value Table (VVT) and String/Array Table (SAT).
40	Calculation of location of pointer to screen display memory (ST) and of address of screen display memory (DDA).
50-60	Calculation of Offset (OFS) from the start of the String/Array Table to a given line in the screen display memory (GR.4 uses 10 bytes per line). V3 and V2 are the high and low bytes of this offset. POKE the offset (V2 and V3) and the current and dimensioned length (10 for both) of each screen display string (AA$ to FF$) into the Variable Value Table. Note that to simplify the coding, these strings were dimensioned first, and no variables were declared until this was done. This makes sure that the first six entries in the Variable Value Table will be the desired strings.
70	Dimension temporary holding strings. Used to load data strings.
80	Bypass subroutine.
90	Subroutine to read data and insert into HG$.
100-150	Insert HG$ into appropriate data string.
160	String handling routine. By rotating different data into the screen strings, desired graphics can be scrolled across the screen.
170	Timing loop to slow movement.
180	Read data and load into strings.
190-200	Scroll data from right to left across screen.
210	Reverse motion.
220	END.
230-280	DATA statements.

Outpost: Atari, continued...

our way of thinking. Listing 3 gives a simple program that stores data in six strings and then locates another set of strings in the screen display data area. Then, by use of the Basic string manipulation commands, data are scrolled horizontally across the screen. The data movement is jerky by machine language standards but still impressive and useful when compared to the other techniques available in Basic.

Of course, you can go to the "player-missile" system to get easily programmed horizontal scrolling. But note that the player width is only one byte. Even if you link the four players together, the maximum width is only four bytes. With the string techniques, however, the horizontal "width" of your graphics data is limited only by the memory capacity of the Atari.

This string-modification technique can also be used to provide rapid vertical motion for a "player" in the player-missile graphics system. To move a player vertically, the player data must be continuously relocated within the player memory area. Using PEEK and POKE is excruciatingly slow. The use of strings, however, provides the capability of rapid movement. See George Blank's "Outpost: Atari" in the April 1981 issue of *Creative* (pp. 194-196) for a full explanation of this technique.

If you try to print your graphically loaded strings to the screen to check the results, you will get an unpleasant surprise. Your graphics symbols will probably include some editing characters. These will perform their function when printed to the screen, causing your string to perform strange gyrations. The result will be an incorrectly printed string. The best solution to this problem that I have found is to convert the graphics symbols back into ATASCII data and print them. An example for a 360 character string is given below.

```
1000 OPEN #3,8,0,"P:"
1010 FOR X=1 TO 360
1020 ST=ASC(Z$(X,X))
1030 ? #3;ST;",";
1040 NEXT X
1050 CLOSE #3
```

This will print out your original numerical data for checking. If you wish to print to the screen rather than to the printer, simply replace P: in line 100 with S:. ☐

Listing 3.

```
10 DIM AA$(1),BB$(1),CC$(1),DD$(1),EE$(1
),FF$(1)
20 DIM A$(100),B$(100),C$(100),D$(100),E
$(100),F$(100)
30 GRAPHICS 4:VVT=PEEK(134)+256*PEEK(135
):SAT=PEEK(140)+256*PEEK(141)
40 ST=PEEK(560)+256*PEEK(561)+4:DDA=PEEK
(ST)+256*PEEK(ST+1)
50 FOR T=0 TO 5:OFS=DDA+90+(T*10)-SAT:V3
=INT(OFS/256):V2=OFS-256*V3
60 POKE VVT+(8*T)+2,V2:POKE VVT+(8*T)+3,
V3:POKE VVT+(8*T)+4,10:POKE VVT+(8*T)+6,
10:NEXT T
70 DIM SM$(10),HG$(100)
80 GOTO 180
90 READ SM$:HG$(LH,LH+4)=SM$:LH=LH+5:RET
URN
100 A$=HG$:RETURN
110 B$=HG$:RETURN
120 C$=HG$:RETURN
130 D$=HG$:RETURN
140 E$=HG$:RETURN
150 F$=HG$:RETURN
160 AA$=A$(I,I+9):BB$=B$(I,I+9):CC$=C$(I
,I+9):DD$=D$(I,I+9):EE$=E$(I,I+9):FF$=F$
(I,I+9):RETURN
170 FOR T=1 TO 30:NEXT T:RETURN
180 FOR X=0 TO 5:LH=1:FOR Y=1 TO 20:REST
ORE 230+(X*10):GOSUB 90:NEXT Y:GOSUB 100
+(X*10):NEXT X
190 I=1:GOSUB 160:GOSUB 170:FOR I=2 TO 9
1:GOSUB 160:GOSUB 170:SETCOLOR 0,INT(RND
(0)*14)+1,INT(RND(0)*9)+4:NEXT I
200 FOR X=1 TO 10:GOSUB 170:NEXT X
210 FOR I=91 TO 1 STEP -1:GOSUB 160:GOSU
B 170:SETCOLOR 0,INT(RND(0)*14)+1,INT(RN
D(0)*9)+4:NEXT I
220 ? "}":END
225 REM TYPE DATA AS GIVEN IN REM STATEM
ENTS AFTER EACH LINE. DO NOT TYPE COMMAS
 BETWEEN SYMBOLS.
230 DATA    >  :REM CNTRL COMMA,CNTRL X,>
,CNTRL X,CNTRL COMMA
240 DATA |$T$ :REM SHIFT =,SHIFT 4,T,SHI
FT 4,CNTRL COMMA
250 DATA VZ~B :REM INVERSE V,Z,ESCAPE CN
TRL BACK S,B,CNTRL COMMA
260 DATA VZ~  :REM INVERSE V,Z,ESCAPE CN
TRL BACK S,ESCAPE CNTRL >,CNTRL COMMA
270 DATA |$T  :REM SHIFT =,SHIFT 4,T,INV
ERSE CNTRL Y,CNTRL COMMA
280 DATA    >  :REM CNTRL COMMA,CNTRL X,>
,ESCAPE CNTRL >,CNTRL COMMA
```

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John J. Anderson

Before we get started with the column this time around, I would like to put out an all points bulletin to Commodore computer owners everywhere, in the form of a call for manuscripts.

Here at *Creative Computing* we are currently amassing material for at least two books about Commodore computers. *The Creative Vic-20* and *The Creative Commodore 64* will continue in the tradition of *Creative* microcomputer books, providing a compendium of articles about the two hottest Commodore machines around.

If *you* have a contribution to make to either of these two books, we would be most happy to evaluate it for inclusion in either or both books. Because we like to include new material in the anthologies, *your* application, program or review may be just what we are looking for. So get it done. Make sure that it is typed, printed out, or otherwise legible, and *double-spaced*. Attach program listings, photos, and/or diagrams. Then get it in the mail to us.

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Who knows? Perhaps your own work will be immortalized by Creative Computing Press. So get cracking!

In this month's column, we'll take a look at a very controversial topic concerning the Commodore 64, then evaluate a new mass storage device for the Vic-20 and 64 machines.

The Great Commodore 64 Video Controversy

When the Commodore 64 first arrived on the microcomputer marketplace, it caused quite a stir. It was the first home computer with 64K standard; at an announced list price of $595, it was a real bargain.

In the business of microcomputing, six months is a generation, especially in price strategies. Now all you need to do is leaf through the mail order ads in any microcomputer magazine to find the 64 selling for $350 and less, postpaid. I confidently predict that the machine will break the $299 barrier very soon. It won't be long before a Commodore 64 system with disk drive and printer can be purchased for less than $1000.

At those prices, the Commodore 64 is very hard to beat. It offers sprite graphics, built-in Basic, and very sophisticated three-voice sound capability. Logo and CP/M have been slated for upcoming release. Add to this, announced piano keyboard peripherals and advanced gaming capabilities, and you have the perfect home computer, right?

Seeking Resolution

Well, maybe. The reputation of the 64 has been clouded by reservations about the quality of its video. We have received inquiries from all over this country and beyond, asking us to comment on the video quality of the 64. Some people tell us that the pictures they have seen on screens at their local computer stores are singularly unimpressive. Others ask us whether early models carry insufficient RF shielding, causing interference.

Most often consumers poised to purchase a low end microcomputer ask whether a problem with video should affect their decision to choose the 64. My answer is no.

Scout's honor and for the record, though it may not be the best in its class, the Commodore 64 is capable of producing a very acceptable color video signal.

Before a user passes judgment on the reception of a unit in a department store, computer store, or even his own home, he should understand some of the obstacles to good video, and the requisite steps to overcoming such problems. Commodore 64 video is definitely one of the more persnickety signals you may encounter, and without a doubt it demands kid glove treatment. You must realize that it will not look the way it did on an NEC monitor in the store when you hook it to the 20-year-old Philco in your den, though I admit that the salesperson seldom underscores this before a sale.

It has been my experience, however, that a video signal is rarely well tuned in a retail store. Think of how lousy the pictures look on the ordinary TVs in a department store, then think of the additional skill required to set up a computer. You can usually do better at home. Of course, there are limits to how well you can do with an ordinary TV, especially with a 64. Actually, the most dramatic way to improve the output of a Commodore 64 is with a video monitor.

When you hook a computer to your home TV set, you route the signal through a special modulator. Then the video and audio signals are sent through the antenna input and tuner of the set, just as if it were this week's segment of *60 Minutes*. Although this is certainly a convenient means of accessing a preexisting CRT, it has severe limitations The signal degenerates in passing through the tuner section of the set—if only the video and audio signals could bypass all of that, and go directly into the circuitry designed to get the picture on the screen and the sound into the speaker.

That is exactly what many inexpensive raster monitors are designed to do. The two we have at Creative are the Amdek Color I and the TI Color Monitor. Both have built-in amplifiers and speakers to handle audio, and either can be purchased for under $400. The difference between the video quality of the 64 on a regular TV and one of these monitors is very striking—the monitor video looks twice as sharp and can take much greater color saturation without "bleeding"—the extremely unfortunate smearing of borders between clashing colors, which is the foremost complaint I have heard from owners of the Commodore 64.

Apparently Commodore has taken the complaints to heart, because they are introducing their own inexpensive raster monitor.

If you have been thinking about getting a monitor, you should be aware of another potential boon: No longer need the other members of the family equate your time on the computer with their loss of regular TV. I might mention that this made quite a difference in my own life with wife and micro.

Whether or not you have a monitor, there are further steps you can take to maximize the signal of the 64. One of the first points I noticed about tuning in its video is that the monitor must be set quite differently from the levels I had thought of as "default" (based on the time that I have logged with Apples and Ataris). In fact, on the Amdek, my monitor of choice, there are detents for default settings which always seemed about right for those machines. Not so with the 64.

The most important change is to back off on the color level. This will immediately improve reception in almost every case: The Commodore chroma level is designed for less saturation than other machines, and less than broadcast TV too. Next, *increase* the brightness and *decrease* the contrast of the picture. This, combined with lessened color intensity, will improve video quality substantially.

Although colors on the 64 will be less vibrant at these settings, they still can be very bright. If they look washed out, go ahead and boost color saturation. Look for an overall balance between less than usual color and contrast, and greater than usual brightness to reach maximum video quality.

A Look At Raster Technology

And yet, even these steps are not enough to thwart all cases of color bleeding, or some of the other peculiar problems of Commodore video (we've seen them on the Vic-20, too). To understand more about these problems, we must take a closer look at raster technology in general.

In the design of any machine there are trade-offs. In the design of color computers, high-end designers may commit to RGB technology, using special, expensive monitors to create impressive resolution and clarity. On some of these systems nearly photographic results can be achieved, and color bleeding occurs only when desired, by making color borders ragged or pointallistically blended. Modulation to a conventional color TV is automatically ruled out on these systems.

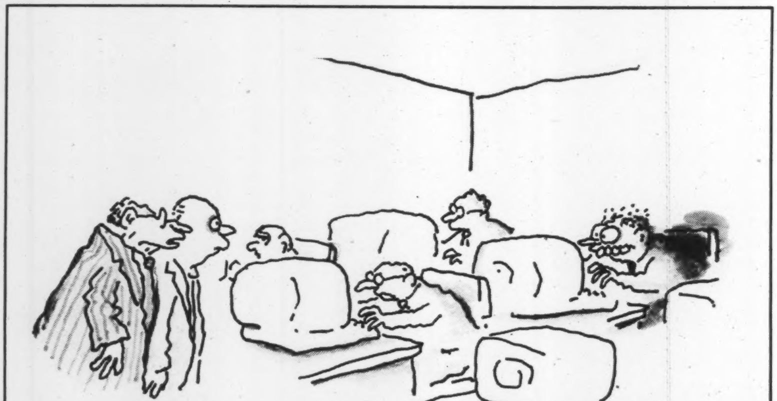
In succumbing to the restrictions of raster technology so that a signal can be pumped to raster monitor or conventional television, the limitations of that technology are passed to the computer designer. The resolution of such systems is very limited, and some kinds of color bleeding can be prevented only by avoiding the color combinations that cause them. These limitations are defined by the system, and nothing inside the computer will get around them.

Let's compare. On the Apple II computer, character sets are always white on a black background, no questions asked. On the Atari, backgrounds can be any of 256 colors, but text must always be white or black, and in many cases, a lack of contrast or severe color bleeding makes certain color combinations unacceptable. On the Commodore 64, there is much greater flexibility. Character sets in any of 16 colors can appear on a background of any of the same 16 colors. The color of multiple characters can be controlled individually in a very straightforward manner with direct keyboard commands (pressing CONTROL-WHITE turns the cursor and all subsequent characters white). Combined with the keyboard graphics characters, this flexibility offers a powerful graphics tool.

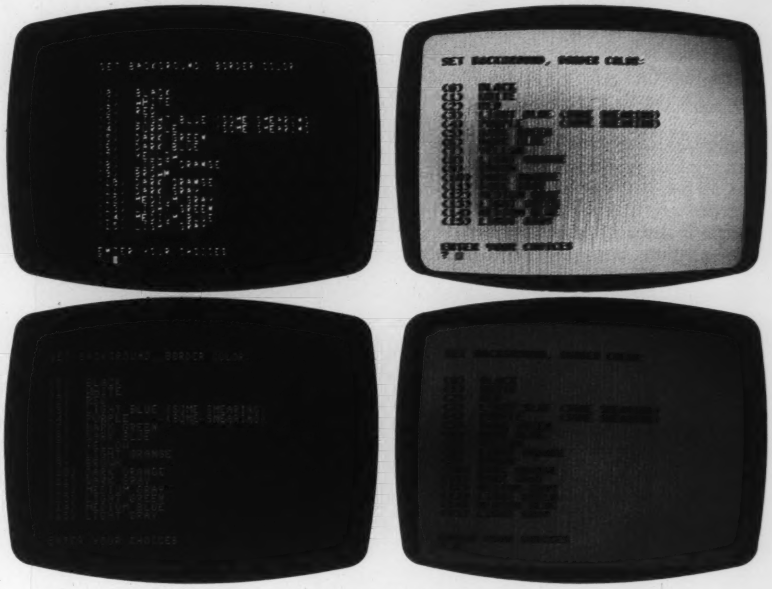
It also creates problems. Many color combinations render the characters completely indistinguishable. Then there are the default color settings, which are mediocre at best. Though there is no bleeding, the light blue characters on a dark blue field with a light blue border are real eye-strainers. No wonder people complain about video on the 64 with such a case of the blues. At the least, the temptation is to turn the cursor white on the default background. Alas, that causes color bleeding.

Before I could get serious about programming with the 64, I had to solve this problem. The result is presented here as Program 1. It very simply makes all background and border combinations as easily accessible as character set colors and automatically picks the best available character set color to complement a chosen background. The choices always represent a color combination causing the least possible color bleeding.

As you can see from the color photographs reproduced here, many character set/background combinations are far superior to the default set, and I think you



"Biggs, go see what program Wilson's working with!"



A sampling of complementary color combinations for the 64.

will agree that the video quality is very acceptable.

The only backgrounds I couldn't do much with were 3 and 4, cyan and purple. Those backgrounds create smearing problems with all other colors. My advice is to avoid them except for border colors and character graphics applications (on a black background).

All 14 other colors have complements that work out very nicely. Most of the time they are light and dark versions of the same color: light green on a dark green background or dark green on a light green background. In some cases another combination works out, such as yellow, color 7, which looks good with brown text on it.

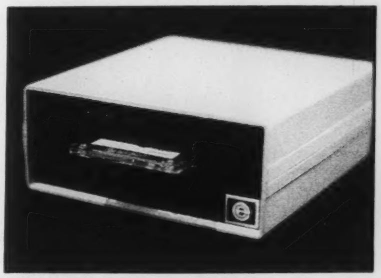
The reverse of default, using dark blue letters on a lighter blue background, is greatly superior to the default, I think. But my favorite is number 12, medium gray—very restful on the eyes while maintaining good contrast. After choosing it as a background, you can turn the cursor shade white, light gray or black, with absolutely no smearing. This could be very handy for applications that call for highlighted text.

After any set of choices, the values to be POKEd for that color combination are enacted, then listed at the top of screen. As the character set color changes *after* these lines are printed, you will see some great examples of severe smearing in the POKE read-out lines. To bring them in clearly, you may have to select the same color combination a second time. Then they will be displayed in a suitable color combination. You may note the figures to include wherever that color combination is desired in other programs.

The Program

The program is short and self-explanatory. It displays the locations and values needed to create each color combination. I encourage you to use it as a starting point. Other complementary color combinations I did not include are surely available—you are by no means locked into the automatic choices here. But they do provide a basis on which to build.

There is another strange idiosyncrasy of 64 video, which seems, unfortunately, impossible to remedy. Even on a monitor, we see light, parallel vertical lines on all backgrounds except black, gray, and white. The only thing we can do is lessen contrast to minimize them. Though they are by no means severe, they are the kind of thing that just does not happen on an Apple or Atari. I do not know whence they emanate, but my guess is that they are *not* RFI related.



The Exatron Stringy Floppy.

Well, I hope I have made the issues at stake and the image of the 64 a bit clearer for you. Of course the only way to really get the picture is to resolve it for yourself.

The Wafertape Alternative

If you own a Vic-20 or Commodore 64, you know that up until now your media for mass storage have been limited to two parochial choices. You could make an investment in the speed, convenience, and reliability of a disk drive. The only problem with this approach is cost, which in some cases exceeds that of the computer itself.

But if you chose not to part with $400 for a drive, you were stuck with the very dreary prospect of cassette storage, using the inexpensive Datasette recorder. The snag: Although audio cassettes are great for storing the superlative audio of Kate Bush, they are not so good at storing digital data. They are necessarily slow and unreliable and do not offer the possibility of random access.

But now there is another form of storage for data from your Vic or 64. It is the wafertape or stringy floppy.

A wafertape? What's a wafertape? Well, a wafertape is something like a cassette, only quite a bit smaller, actually about the size of a credit card and not much thicker. It is wound in a continous loop and can be of various lengths (20 feet is standard). The tape is driven at about eight inches per second, and a 20 footer can hold about 16K of data. The splice connecting the tape into a loop is silver and can be detected optically by the drive. By counting out footage from the splice, the stringy floppy can approximate random access, though it may take substantially longer than random disk access.

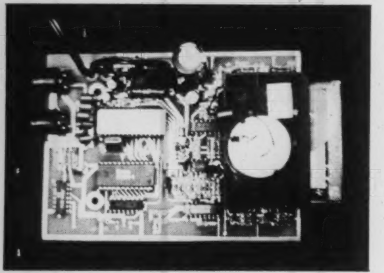
Stringy floppy? Well, yes, the term "stringy floppy" is probably a misnomer because the medium is neither stringy nor floppy. The intent is to evoke the image of a tape medium capable of many of the same features as a disk.

Though the wafer is smaller than cassette, it is a much more reliable computer storage medium. The tape speed of

STRINGY
FLOPPY
WAFER
20
CERTIFIED

The wafertape is compact and continuous.

8 ips (as opposed to 1½ ips for audio cassette) speeds data transfer and greatly increases the reliability of that transfer. Tape drop out and transport problems are minimized. In addition, wafers can be write protected in a manner akin to floppy disks.



A look inside the unit.

The hardware unit is extremely compact and relatively free of mechanical parts in its transport mechanism (see photos). Your Vic-20 or Commodore 64 addresses stringy unit 0 as device 20. A second drive will be device 21. They attach in the same manner and via the same DIN pinout as a disk drive. The Datasette drive can remain attached and operational along with a wafertape device, which can also be daisy-chained via DIN to other devices, including disk drives and printers.

At about $200, the Exatron Stringy Floppy delivers performance placed about half way between a cassette and a disk drive. As a potential buyer you must ask the question whether waiting for savings to increase and disk drive prices to fall is preferable to committing to a wafertape system.

There are many factors to consider. Wafertapes are relatively expensive (about $3.00 each—not much less than a disk), and are available from only a single source: Exatron. Don't look for preprogrammed wafers, at least for the foreseeable future.

Couple these factors with the recommendation in the rather lackluster documentation accompanying the unit that you should store only *one* program per wafer until you gain "further experience" with it, and you will realize quickly that wafers are a more expensive storage medium than disk.

Why only one program per wafer? That is a question I asked, too. The documentation equivocates. As I discern it, the answer points out the main disadvantage of the wafertape drive. To store multiple files on a single wafer, you must advance to a clear area of the tape by loading through existing files, and then use a special save command. The unit will return an error condition if a single save file is longer than wafer capacity, but it will write quite blithely over existing files with no checks whatsoever. It is up to you to estimate how many files of what sizes may share a single wafer.

Although its performance was good, it seems to me that the ESF 20/64 is an unfinished product in many ways. The potential is there for a new and reliable storage medium, but that potential is not fully reached. The unit is just too dumb, falling in the lamentable category of products that call upon the user's brain memory as buffer to take care of tedious details. Written files can be verified, but it is just too easy to blow an existing file while writing a new one. The stringy floppy I tested was not only exceedingly dumb, but didn't even have an on/off switch. This means that you have to get on all fours to plug and unplug the unit to use it. That is really annoying.

Whether or not the wafertape has any real future in the microcomputer industry is for Exatron to decide. If it takes the time to finish its product, that certainly will be a start.

I think that despite its problems, the wafer does have some real advantages as a medium. It is smaller, more powerful, and more reliable than conventional cassettes. It could be made portable because its low-voltage motor could be battery powered. And for single file storage, it is relatively easy to use. Apparently, Coleco agrees, because it will market a read-only stringy unit for single file preprogrammed Colecovision games. Compared to ROM storage, the wafertape is a very viable alternative.

But the price must drop substantially if the ESF 20/64 stringy floppy is to survive. At the price of the Datasette, the stringy floppy begins to look like a much more attractive product. At $200, however, it is simply too much for too little. The thought of two wafertape drives on a system at the same cost as a single disk drive is laughable (although the Commodore disk drive has its problems). It is simply not an option any educated consumer would consider for long.

The ESF 20/64 is covered by a very attractive warranty however, and should provide reliable, though limited service.

Next month: graphics and sound on the Commodore 64. □

Program 1.

```
10 REM SETCOLOR SUBROUTINE
20 REM BY JOHN J. ANDERSON
30 REM FOR THE COMMODORE-64
40 PRINT"⊐"
50 GOSUB 200
60 GOTO 50
200 PRINT:PRINT"SET BACKGROUND, BORDER C
OLOR:":PRINT
230 PRINT"(0)  BLACK
240 PRINT"(1)  WHITE
250 PRINT"(2)  RED
260 PRINT"(3)  LIGHT BLUE (SMEARING)
270 PRINT"(4)  PURPLE     (SMEARING)
280 PRINT"(5)  DARK GREEN
290 PRINT"(6)  DARK BLUE
300 PRINT"(7)  YELLOW
310 PRINT"(8)  LIGHT ORANGE
320 PRINT"(9)  BROWN
330 PRINT"(10) DARK ORANGE
340 PRINT"(11) DARK GRAY
350 PRINT"(12) MEDIUM GRAY
360 PRINT"(13) LIGHT GREEN
370 PRINT"(14) MEDIUM BLUE
380 PRINT"(15) LIGHT GRAY":PRINT
390 PRINT"ENTER YOUR CHOICES":INPUT X,Y
400 POKE 53281,X:PRINT"BACKGROUND--POKIN
G 53281,";X
410 POKE 53280,Y:PRINT"BORDER--POKING 53
280,";Y:PRINT"CHARACTER SET--POKING 646,
";
420 ON X GOTO 440,450,460,430,470,480,49
0,500,510,500,520,430,530,540
430 POKE 646,1:PRINT"1":RETURN
440 POKE 646,12:PRINT"12":RETURN
450 POKE 646,8:PRINT"8":RETURN
460 POKE 646,11:PRINT"11":RETURN
470 POKE 646,13:PRINT"13":RETURN
480 POKE 646,14:PRINT"14":RETURN
490 POKE 646,9:PRINT"9":RETURN
500 POKE 646,2:PRINT"2":RETURN
510 POKE 646,7:PRINT"7":RETURN
520 POKE 646,15:PRINT"15":RETURN
530 POKE 646,5:PRINT"5":RETURN
540 POKE 646,6:PRINT"6":RETURN
```

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Susan Glinert-Cole

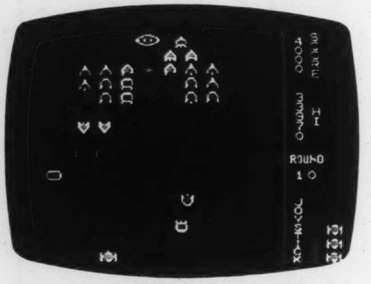
While it is usually not expressed in quite this way, there is an old proverb about how every silver lining has a cloud firmly attached to it. Writing this column gives me a chance to experiment with new software and peripherals and express my opinion about them (for whatever it's worth). This is very gratifying for someone who is known to express strong opinions and who, among her other positive attributes, likes the smell of burning disk drives. It has been said that the human organism can get used to anything.

We have become acclimated to eating in the kitchen (the dining room is doing a swell imitation of a software department store), and our friends have become very careful of how they sit down lest they evoke the crunching noise associated with crumpled disks. The cloud that has settled on us consists of alien ship debris. I mean, this column practically didn't get done this month, and it was only with the most incredible self control that I managed to emerge long enough to share my problem with you.

Cosmic Crusaders

If anyone tried to tell me that I, a sweet, peace-loving individual who will admit to killing only an occasional mosquito, would get hooked on a game, the purpose of which is to slaughter aliens, I would have replied *bushwa* (or words to that effect). This game was brought into the house by someone I prefer to forget I ever knew; it is terrific and unbelievably addictive. My husband, who used to sidle furtively past the computer with an air of distaste now hangs onto the back of my chair wondering when I will be finished with this column silliness so he can play *Cosmic Crusaders.*

Closet frequenters of video games palaces tell me it resembles Galaxian, but it is in a class by itself for the IBM PC (I ought to know, I have been trying out games for weeks). It is from the same company, Funtastic, which publishes *Snack Attack*—also an excellent game.



Cosmic Crusaders is written in assembler, and the action is fast and responsive. The general objective is to mop up alien vessels which appear in formation and then peel off into dives, all the while merrily dropping pink and green bombs on your ship.

A mother ship appears occasionally; her payload is a bunch of fetching cerise asterisks. The player is allotted five shields to start, and can earn more by hitting the refueling station when it flip-flops across the screen. Eliminating one barrage of ships brings on another set which is faster and nastier. As with most games of this type, you can't win.

The game can be successfully played with the keyboard, and it is possible to change the keys around if you don't like the way Funtastic set it up. We played with this configuration for a couple of weeks (until the game board and the joystick arrived from the same unmentionable person who is obviously trying to ruin my life), and we both found the keyboard set-up comfortable.

There is no question that it is easier to play this game with a joystick; we both beat our highest keyboard scores with the joystick on the second try. The six highest scores can be saved to disk or reset to avoid constant humiliation of one's husband (heh heh).

The sound effects are appropriate to galactic devastation, but are not obnoxiously overt; for those who like the concept of silent havoc, the noises can be turned off. The game is copy protected, which gives me a silent clutch lest something happen to it, but Funtastic will replace it free if it fails anytime.

They tell me that two new games are due out soon: *Big Top* and *Master Miner.* My irresponsible side awaits their arrival with anticipation usually reserved for things like Christmas bonuses.

Susan Glinert-Cole, RFD #2, Box 389A, South Windham, ME 04082. Correspondence can only be acknowledged when a stamped, self-addressed envelope has been provided.

Double Sided Disk Drives

I installed a pair of these a few days ago. Their most outstanding feature is their silent operation; with a disk drive cover on, it is barely possible to hear them, and it took a little while to get used to the absence of the grind, grind, grind of the Tandon drives. There were two minor modifications required before installation.

The first was to remove a jumper block from its socket, bend some pins out, and replace it. The second was to remove a resistor network and discard it. Both procedures took a couple of minutes for each drive and the instructions which accompanied them were very clear. I have had no trouble with them at all, and if you haven't converted your IBM PC to double-sided drives yet and would prefer some that are easier on the ear, these drives are no more expensive than Tandon drives and are well worth considering.

Le Ribbonizer

A few devices have recently appeared on the market which re-ink printer ribbons. I find it objectionable, both on the pocketbook and New England philosophy, to discard a cartridge after only one use, and anything that would alleviate the boredom of winding the ribbon through by hand after reinking the rollers looked like a good bet.

The machine itself is just a motor mounted under a flimsy plastic shell with two felt rollers on the top of the case. For $39.95 I think the company could have used a sturdier plastic. It isn't that there is a great deal of mechanical stress on the machine, but, because the plastic is so frail, it is necessary to repack it carefully and store it away, because it would not take much to crack the plastic.

Le Ribbonizer comes with a small bottle of ink, printed instructions and a pair of plastic containers in which to store the rollers after use so the ink won't dry out. The first step is to pre-ink the rollers by repeatedly dropping a bead of ink on the tops of the rollers and waiting until the ink has been absorbed.

The instructions promise that the first time is the worst, and I certainly hope so because the process took about half an hour. The cartridge is secured to the top of the reinker by positioning it on a small metal shaft and then snapping a wire bail over the top. At this point, all that is required is to turn on the motor and spend twenty minutes playing *Cosmic Crusaders.* I can attest to the fact that the motor does not overheat if left unattended for an hour, which was how long the twenty minutes lasted.

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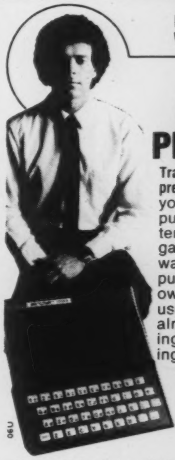

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a plastic bag to distribute the ink evenly and that's it, almost. There is one last thing to do, and it was such a frustrating mess that it made me regret that I was ever unfaithful to my bottle of stamp pad ink. Remember the plastic storage containers? Well, you have to pull the rollers off of their shafts to store them in these canisters. There is absolutely no way to do this without getting ink all over everything, and worse, the little rubber sleeves on the top of the rollers fall off and getting them back on distributes additional ink in an extremely inconsiderate manner. I was so aggravated that I disgustedly tossed the whole machine back in its box.

I suspect that putting the entire machine inside a plastic bag might eliminate the need to store the rollers separately. The next time I reink a ribbon, I will give this method a whirl. Ben Torres Ribbon Service also sells new and reloaded ribbons which I might revert to if the above solution doesn't pan out.

DOS 2.0

I finally borrowed a copy of this new operating system a few days ago; there doesn't seem to be an extra copy anywhere at the time of this writing, and I haven't had a chance to delve into it thoroughly. The newest version has so many improvements and enhancements that it would be impossible to cover all the additions in one column, so I will dance across the high spots (and the low ones too).

There are a few gripes I have about DOS 2.0 that are minor, but irritating. The organization of the documentation is appalling. Information on the same subjects, like tree-structured directories, is scattered throughout the notebook. Some of the information is listed under the hard (fixed) disk chapter, some in the chapter on tree structured directories and some in the section on DOS commands.

The organizational problem pales in comparison to a slightly broken ring binder. DOS 2.0 is too big for the binder supplied with it, and, with one of the rings misaligned, it is not possible to flip easily through the book without the pages coming out of the rings; they then get torn and lost, and trying to find anything is a real megillah.

Why IBM cannot supply section dividers is beyond my comprehension. If the documentation is organized (or disorganized) in such a way that you are forced to keep paging through it, a set of dividers would ease that pain considerably. As it stands now, I buy packages of little dividers and make my own but there is probably an enterprising soul out there who could design and print a nice set (there is a ready customer right here). Having griped my gripes, I move right on to some of the high points.

The non-system programmers will find three completely new features immediately appropriate for their use: input/output redirection, filters, and hard disk support (including a new type of directory structure). I will talk primarily about these features this month.

Device redirection, or "piping," as it is sometimes called, allows a program or batch file to get its input from and direct its output to any file which can send or receive a stream of data. Suppose, for example, you wish to create a file by using COPY CON:FILEA. Normally, this will take the input you type from the keyboard and write it to FILEA. It is now possible to redirect the output to the printer by typing

```
COPY CON:FILEA > PRN.
```

In this manner, it is easy to get a directory listing sent to the printer by typing `DIR >PRN` or, if a file containing the directory is wanted, `DIR >DIRFILE` will send the directory to DIRFILE on the default disk drive. Redirecting input is just as simple.

Suppose in a batch file you wish a program to receive its input from another file instead of from the keyboard; inserting the command `THISPROG <THATPROG` causes input to THISPROG to come from THATPROG. This feature eliminates a great deal of file opening and closing from inside a program; the system will do it for you.

There is a slightly different format for piping when using the output of system commands as input for another system command, which I will talk about in the next section.

My favorite additions to DOS are the filters now supplied with it. A filter is a program which takes data from some specified input device, modifies it, and then writes the modified information to an output device. DOS 2.0 now contains three of these very useful programs: FIND, SORT and MORE.

The FIND filter is *wonderful.* This command takes all lines from the file specified which contain (or do not contain) a specified string and sends them to any specified output file. I had planned, in the next month or so, to write a program which would remove all remarks contained in a Basic program. This project is now unnecessary thanks to FIND. The only caveat in using this filter for this purpose is that all remarks must be on a separate line in the program, since FIND, when used in this way, removes the entire line. Naturally, the program must be saved as an ASCII file. The format of the command is as follows:

```
FIND [/V] [/C] [/N] "string"
  [[d:] [path] filename
  [.ext]...]
```

This looks pretty terrible, but is not really quite as confusing as it seems. The command `FIND "rem" B:TEST1.BAS` will list to the console all the lines in TEST1.BAS (on drive B) which contain the string "rem." This is not exactly what is wanted in this case, since we want to remove all lines with this string.

How's this for inspiration? Let's junk the novel and start designing computer software.

The command `FIND/V "rem" B:TEST1.BAS` will display all the lines that do *not* contain the string "rem." This is better, but listing the program to the console is an academic exercise. What is really needed is some way to save the filtered program. A little redirection of the output in the form:

```
FIND /V "rem" B:TEST1.BAS
>B:TEST1.REM
```

will find all lines which do not contain "rem" and write them to TEST1.REM on drive B. Fantastic! More than one file may be filtered at a time by simply listing the files, separated by a space, after the string parameter. Now suppose you want to locate all of the entries in a file directory which contain the string "txt." As mentioned above, this type of redirection has a slightly different syntax, as we are dealing with the output from a system command, as opposed to a file.

This format uses the double bar located above the reverse backslash on the keyboard (this is not a colon) and looks like this:

```
DIR ! FIND "txt" >B:TXT.TXT.
```

This command would take the entries for the directory on drive A, find all file names that contained "txt" and would write them to file TXT.TXT on drive B.

The /C parameter causes FIND to display the number of matches of the string it found in each file without actually displaying the lines containing the string. The /N parameter outputs the relative line number of each match ahead of the line from the file.

Another pleasant feature of DOS 2.0 is the SORT filter. This command will sort lines of data according to the ASCII collating sequence. The format is:

```
SORT [R] [/+n]
```

where the /R option will sort in reverse order and the /+n parameter (n is an integer) will begin the sort starting with column n. This feature is most useful in sorting directories. For example:

```
DIR ! SORT >B:SORTED.DIR
```

would sort alphabetically the directory on drive A and write the sorted list to SORTED.DIR on drive B.

The third filter available is the MORE command. This command will read data from an input file and send one screenful at a time to an output device, pausing with the pregnant message—More—. To display another screenful, press any key. The format looks like this

```
MORE <B:TEST1.BAS.
```

This would display one screenful at a time of TEST1.BAS, found on drive B to the console.

With DOS 2.0 it is now possible to queue files for printing and still be able to do other jobs while the printer is merrily chugging away. Up to ten files can be lined up for outputting at any one time and global file names are allowed in the queue. The format looks like this:

```
PRINT [[d:] [filename[.ext]]
[/T] [/C] [P]...]
```

The /T parameter is the terminate command and it cancels all files from the print queue. The /C sets the cancel mode and permits selection of the files which you wish to delete from the queue. The /P sets the print mode again.

```
PRINT FILE1 FILE2 FILE3
B:FILE4 FILE5 FILE6
```

would put these six files in the print queue and send them to the printer. If you wish to stop the whole process, type `PRINT/T`. If you want to delete the last two files from the queue, type `PRINT FILE5/C`. If only FILE5 is to be deleted type `PRINT FILE5/C FILE6 /P`.

The printer is the default device for this command, but files may be queued in this manner to any output device (e.g. COM1, AUX, LPT1).

The most important feature of the new DOS is the fixed disk support, which introduces a new structure for file directories. The old versions of DOS used a linear directory structure in which each disk contained one directory under which all the files on that disk were listed. These directories could hold a maximum of 64 files (for single sided disks) or 112 files (for double sided disks). This scheme worked reasonably well for disks that did not contain many files; I did find it bothersome when the number of files exceeded about 20 per disk, especially if programs, correspondence, and graphics programs were all mixed up.

My backup disks tended to be chaotic, since I would grab anything that had room for a backup on it, promising myself that some rainy Sunday I would carefully reorganize everything. While Maine has enough rainy Sundays to reorganize the Library of Congress, the task never got finished. With the new DOS however, it is possible to organize groups of related files into their own subdirectories. This is absolutely essential for a hard disk, which may contain thousands of files, but it is very convenient for floppies too, if there are several short files which could be categorized according to type.

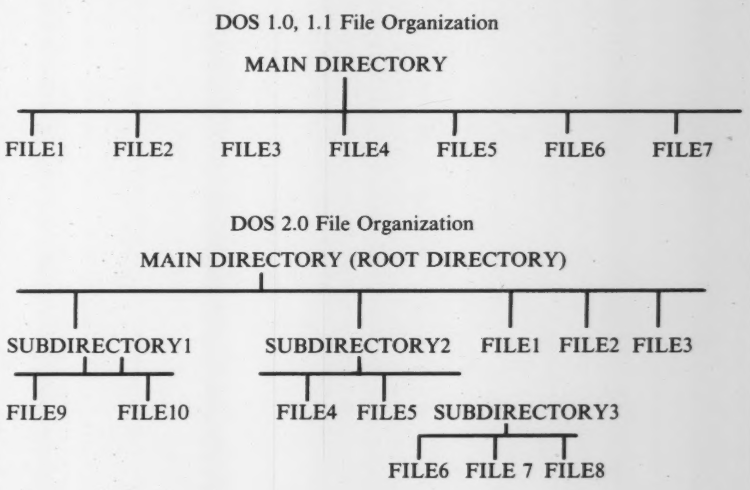
DOS 2.0 uses a tree data structure for file organization. The two types of data structures are shown in Figure 1.

In DOS 2.0, when a disk is formatted, a main, or root, directory is created. The main directory may contain files or subdirectories and these subdirectories (which are actually files themselves), may in turn contain files and subdirectories. When DOS is booted, the main directory is always the current one, but any subdirectory may be designated as the default by issuing a `CHDIR` (Change Directory) command:

```
A> CHDIR [d:] path
```

The path is the route to the subdirectory of choice. In the figure above, the path to SUBDIRECTORY1 is:

```
A> CHDIR/SUBDIRECTORY1
```



Note: Names for subdirectories follow the usual DOS convention of eight letters and an optional three-letter extension. SUB DIRECTORY is therefore not a legal file name and is used here for clarity purposes only.

Figure 1.

(SUBDIRECTORY1 is now the current directory) and the path to SUBDIRECTORY3 is:

```
A> CHDIR/SUBDIRECTORY2/
SUBDIRECTORY3
```

(SUBDIRECTORY3 is now the current directory)

To return the system to the root directory as the default, use CHDIR with no parameters:

```
A> CHDIR/
```

Creating subdirectories is done using the MKDIR command. To create the file structure above, three commands are needed. Each command creates one subdirectory and the parent directory must exist before a subdirectory may be created in it.

```
A> MKDIR/SUBDIRECTORY1
A> MKDIR/SUBDIRECTORY2
A> MKDIR/SUBDIRECTORY2/
SUBDIRECTORY3
```

The third command could also be accomplished by making SUBDIRECTORY2 the default directory and then specifying any subdirectories:

```
A> CHDIR/SUBDIRECTORY2
A> MKDIR/SUBDIRECTORY3
```

Removing subdirectories is a simple matter of using the RMDIR command, but the subdirectory must be empty of all files before it may be removed. Neither the root, nor the current directory (if different than the root) may be removed with this command. The format is:

```
RMDIR[d:]path
```

where the last subdirectory in the path is the one erased. Thus the command:

```
A> RMDIR/SUBDIRECTORY2
```

removes SUBDIRECTORY2 and

```
A> RMDIR/SUBDIRECTORY2/
SUBDIRECTORY3
```

removes SUBDIRECTORY3.

Well, that's swell, you are all saying, but how do I get *files* into these directories? This is simply a matter of specifying the appropriate path when the file is created (and I had to explain the idea of a path first, right?) So let's create the file structure in the thoroughly unimaginative figure above.

```
A> COPY CON:SUBDIRECTORY1
/FILE9
<anything + CONTROL 2>
A> COPY B:FILE10:
SUBDIRECTORY1/FILE10
```

The first command takes FILE9 from the console and puts it into the subdirectory; the second copies FILE10 from drive B to drive A (the default here) and puts it into SUBDIRECTORY1. Files 1, 2 and 3 are placed in the main directory with:

```
A> COPY B:FILE1
A> COPY B:FILE2
A> COPY B:FILE3
```

(Or any variation of global specifications, such as FILE or FILE?)

To put files into SUBDIRECTORY3, follow the same procedure as above, but use the appropriate path:

```
A> COPY CON:SUBDIRECTORY2
/SUBDIRECTORY3/FILE6
A> COPY B:FILE7:
SUBDIRECTORY2
/SUBDIRECTORY3/FILE7
A> COPY B:SUBDIR13/FILE8:
SUBDIRECTORY2/SUBDIRECTORY3
/FILE8
```

This last command will copy FILE8, which it will find on drive B in SUBDIR13, to SUBDIRECTORY3 on drive A.

Directory listings for this type of file structure is done a bit confusingly. Typing a simple DIR command gives only the files and subdirectories listed in the root directory, not a listing of all files found on the disk. It is necessary to specify which directory you wish the files to be listed for and only the files in that particular directory are displayed. The accompanying listings show exactly what the outcome is for each request. At this point I think you get the idea of paths, and I intend to take the fastest one back to my joystick. ☐

Names and Addresses of Firms Mentioned

Funtastic Inc.
5-12 Wilde Ave.
Drexel Hill, PA 19026

Ben Torres Ribbon Service
416 East State St.
Redlands, CA 92373

Route directory.

```
Volume in drive B has no label
Directory of B:\

SUBDIR1      <DIR>      1-01-80  12:41a
SUBDIR2      <DIR>      1-01-80  12:41a
FILE1           42   1-01-80  12:41a
FILE2           57   1-01-80  12:42a
FILE3           59   1-01-80  12:42a
      5 File(s)   349184 bytes free
```

Directory of subdirectory 1.

```
Volume in drive B has no label
Directory of B:\subdir1

.         <DIR>      1-01-80  12:41a
..        <DIR>      1-01-80  12:41a
FILE9          34   1-01-80  12:43a
FILE10        142   1-01-80  12:43a
      4 File(s)   349184 bytes free
```

Directory of subdirectory 2.

```
Volume in drive B has no label
Directory of B:\subdir2

.         <DIR>      1-01-80  12:41a
..        <DIR>      1-01-80  12:41a
SUBDIR3      <DIR>      1-01-80  12:41a
FILE4         159   1-01-80  12:44a
FILE5         176   1-01-80  12:44a
      5 File(s)   349184 bytes free
```

Directory of subdirectory 3.

```
Volume in drive B has no label
Directory of B:\subdir2\subdir3

.         <DIR>      1-01-80  12:41a
..        <DIR>      1-01-80  12:41a
FILE6         167   1-01-80  12:45a
FILE7         226   1-01-80  12:46a
FILE8         316   1-01-80  12:46a
      5 File(s)   349184 bytes free
```

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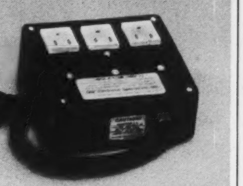

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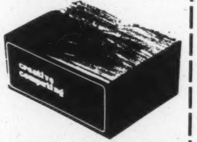

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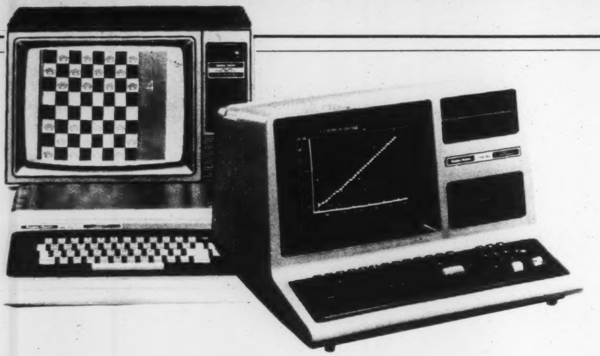


rings...trs-80 strings...trs-8

Stephen B. Gray

As our Radio Shack balloon rises past the 54,000-foot altitude level, we pause to check out a disk catalog program from Sams, the Color Computer Quick Reference Guide, six Color Computer programs from Computerware, and another short screen saver program.

AOS Back to INpolis, Renamed Sams

The first software offered by Howard W. Sams & Co., the technical book publisher, was marketed under the Advanced Operating Systems label (Dec. 1981, p. 322).

AOS was moved from Indianapolis to Michigan City, IN, because the head of the division wanted to live there. He left after a year and a half, AOS moved back to Indianapolis, and the Sams name replaced the AOS name as of December, 1982.

The Sams catalog now includes software, in addition to the type of books that made the company famous. There are programs for the TRS-80, Apple, IBM PC, Commodore and Timex/Sinclair personal computers in areas such as business, word processing, games, electronic engineering, and communications.

We'll be looking at several Sams software products, starting with a disk catalog program in this issue.

Disk Catalog

After you have filled your first disk and have to start a second one, you begin to have trouble keeping track of what program or file is on which disk.

One solution is to keep all programs or files of a particular type on one disk. Keep all the Basic programs on one disk, *Scripsit* files on another, etc. But once you have filled the Basic disk or the *Scripsit* disk, the problems begin again.

Incidentally, one way of keeping track of what is recorded is to use extensions. When someone sends me a letter containing a program for the Short Program section of this column, I first enter the program in Basic with a /BAS extension and a number to indicate the sequence of letters, such as LET037/BAS. Then I type the letter itself in *Scripsit,* using the same letter number but a different extension: LET037/SCR, and call the Basic program from *Scripsit.*

Thus, I know the program part of the Short Program item is correct, because I entered it in Basic and ran it before storing it. Using extensions, I keep the letter text separate from the Basic program, for separate printouts later: the letter with a daisywheel printer; the program with a dot-matrix printer, in case the editor would like to use a more authentic-looking listing.

Master Directory III

However, even with extensions, there comes a time when the only way to go is with a master disk directory program (also called a disk catalog program). A very good one is *Master Directory III,* for a TRS-80 Model III with 16K of memory and at least one disk drive, $39.95 at computer stores or, with a $2 charge per order for handling, from Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, IN 46206.

Using this program couldn't be simpler. Just put the Sams disk in drive 0 and press the reset button. You get a menu with nine choices. At the beginning, you have only one: read the directories from your disks.

After you have assigned each disk a unique number from 0 to 999, and put the number on each disk label, just put each disk in drive 1 (or if you have only one drive, switch the Sams disk and your disks back and forth), give the number of the disk and press ENTER. *Master Directory III* is compatible with almost any DOS, so there is no problem if a disk was made with TRSDOS or DOSPLUS or whatever. Do the same thing with all your disks, and within minutes you have created a master directory that allows you to search for a program or file in several different ways. The system provides seven different reports, which can be displayed or printed out.

You can also catalog an 80-track disk, and read invisible files into your directory.

Searching the Directory

You can ask to see the directory for a disk by entering its number after asking for item 1 on the menu, Disk Directory. If you have any doubt about a particular disk having been cataloged, ask for the Master Disk Listing, which lists all disks in the master directory by name, number, number of free granules, date cataloged, etc.

If space is tight, you can Search For Free Space by specifying how much you need. You can delete the directory for any particular disk, which is necessary, for example, if you want to read in an updated directory.

The most useful command of the system is File Name Search. Just ask for item 6 on the menu and type in the name of the file you want. If you want to see a group of file locations with similar names, use a ? as part of the file name, which means that that letter doesn't matter. If you fill the rest of the filename with ? then you'll get a listing of all files with that name plus all longer names that begin with that name.

If you have forgotten the name of a program or file, or just want to look through the names of everything you have on disk, ask for the Master List Filing, which provides a full directory of all disk programs, in alphabetical order.

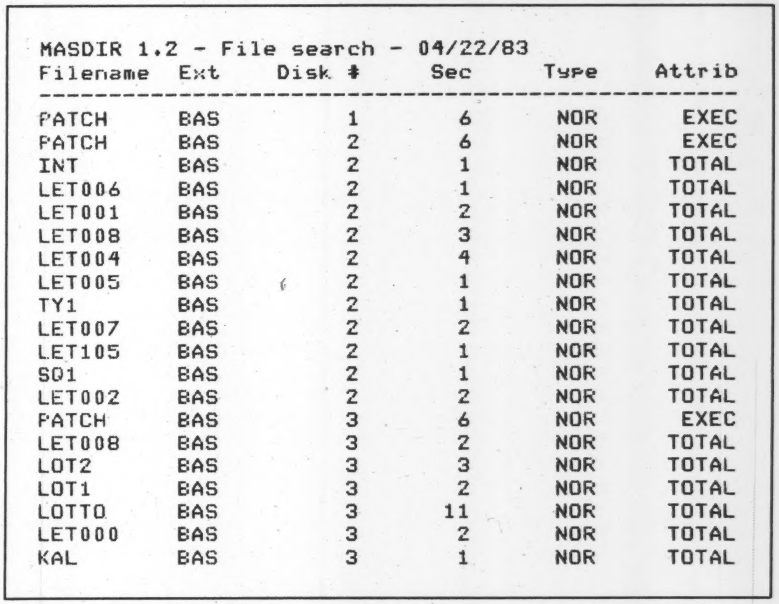
If you know the name of the disk you want (and have given each disk a different name), choose File Listing By Category. To get a report for a requested extension, ask for item 9, File Listing By Extension, which will display and/or print all programs or files using that extension, whether it is SCR or BAS or CMD or PAS or whatever (Figure 1).

That's just about all there is to it. There is no simpler way of keeping track of all your disk files and programs than with the Sams *Master Directory III.*

Quick Reference Guide

A handy new publication, Radio Shack's new $4.95 "TRS-80 Color Computer Quick Reference Guide" is a 71-pager to keep near your computer for a fast lookup.

The guide has just about everything you need for quick reference, including everything that is on those foldout cards that come with the manuals, plus a lot more.



```
MASDIR 1.2 - File search - 04/22/83
Filename  Ext     Disk #      Sec      Type     Attrib
------------------------------------------------------
PATCH     BAS          1        6       NOR       EXEC
PATCH     BAS          2        6       NOR       EXEC
INT       BAS          2        1       NOR      TOTAL
LET006    BAS          2        1       NOR      TOTAL
LET001    BAS          2        2       NOR      TOTAL
LET008    BAS          2        3       NOR      TOTAL
LET004    BAS          2        4       NOR      TOTAL
LET005    BAS          2        1       NOR      TOTAL
TY1       BAS          2        1       NOR      TOTAL
LET007    BAS          2        2       NOR      TOTAL
LET105    BAS          2        1       NOR      TOTAL
SQ1       BAS          2        1       NOR      TOTAL
LET002    BAS          2        2       NOR      TOTAL
PATCH     BAS          3        6       NOR       EXEC
LET008    BAS          3        2       NOR      TOTAL
LOT2      BAS          3        3       NOR      TOTAL
LOT1      BAS          3        2       NOR      TOTAL
LOTTO     BAS          3       11       NOR      TOTAL
LET000    BAS          3        2       NOR      TOTAL
KAL       BAS          3        1       NOR      TOTAL
```

Figure 1. This Master Directory III *report shows programs and files written in Basic and named with the /BAS extension.*

You get nine pages of all the statements, color-coded to indicate which are only for Extended Color Basic, and which are only for Disk Extended Color Basic. Then come lists of functions, ROM subroutines, control keys, color codes, ASCII codes, editor commands, ZBUG commands, 6809 instructions, editor/assembler error messages, memory map, Basic error messages, technical specifications, and many more.

This 4" by 8" guide is wire-bound to stay open beside your Color Computer. Once you have gone through the manuals, this is what you need for quick reference.

Six Programs from Computerware

Four games, a money manager, and a tutorial for the Color Computer were sent by Computerware (Box 668, 4403 Manchester Ave., Suite 102, Encinitas, CA 92024). The four games are all quite exciting, and well worth checking out. The money manager is a sophisticated checkbook balancer, but the tutorial is too expensive for what it contains.

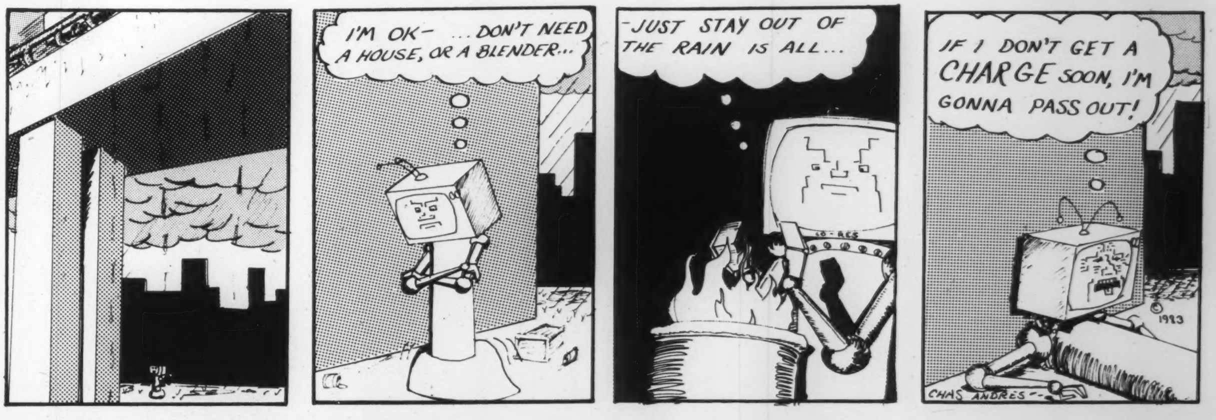
Bloc Head

The game of *Bloc Head* ($26.95 cassette, $29.95 disk) presents a grid of 27 cubes. You are the Bloc Head, and the object is to change the color of the top of each cube to the color indicated in a corner of the screen. All you have to do is use the joystick to move from one cube to another, and the color changes as you land on each.

There are problems, of course. Several monsters will try to jump on you, which could take one of your four lives. If you aim away from the cube grid, you might fall off the edge. But if you can change all the cubes to the new color, you get

BitPit

Chas Andres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IF I DON'T GET A CHARGE SOON, I'M GONNA PASS OUT!
©1983
CHAS ANDRES

bonus points and start all over again.

There are "easy" and "tuff" levels in this intriguing game that will have you jumping all over the screen to change cube colors without getting wiped out.

Nerble Force

You are one of the last human survivors on Nerble, and your goal, as pilot of the last human spaceship, is to defend the planet against the Nerble Force. You control your ship (which has four lives) with the joystick, and fire phasers with the button.

Six types of Nerbloids make life difficult, and must be shot down or avoided. One or two humans can play, at four levels of difficulty, and the game can be frozen (for later unfreezing) or reset at any time.

The action is exciting, as you pilot your ship left and right, up and down, firing away at targets, avoiding mines, always watching the long-range scanner at the bottom of the screen that tells you where the aliens are.

A nice touch: if there are five or more aliens on the screen when you die, your ship supply will not decrease. This lets you "kamikaze" when surrounded, for $24.95 on cassette, $29.95 on disk.

Gran Prix

The longer you stay on the track without crashing, and the faster you drive in this 32K game, the more points you get. Moving the joystick forward or back controls your speed; moving it left and right controls your steering in the high-powered racer.

Just to keep you on your toes, you'll sometimes have to drive at night, or on snow covered roads. You have 100 seconds to rack up points, but if you can get over 2000 points, you earn extended play, in this fast-moving game you will play over and over. The program keeps track of the top ten scores, and is $21.95 on cassette, $25.95 on disk.

Moon Hopper

This 32K game ($24.95 cassette, $29.95 disk) uses an advanced type of moon buggy, with a "secret feature" that allows it to jump over obstacles instead of going around them. On Space Patrol maneuvers, you are attacked by Traglons, so you try to hold them off with phasers while racing to the moonbase for reinforcements. Can you make it before the Traglon saucers blow you to bits?

Choose one of five levels of play, and use the joystick to control speed and direction, the button to fire the phasers. You jump the hopper by moving the joystick upwards for a moment, to leap over craters. Boulders can be jumped or shot.

A long-range scanner at screen bottom tells you how close you are to the base, and you get points for vaporizing aliens and boulders, in this heart-stopping race for life on a dead moon.

Home Money Manager

This is a $29.95 disk based, menu driven, personal checkbook system that "tracks data by Date, Paid To, Check Number, Account Number, Amount of Check, and Current Balance," according to the brief eight-page manual.

The program shows exactly how much you spent on what, and where your income came from. Up to 480 transactions can be recorded.

To use the program, you create a new checkbook file, entering your current balance and information on checks written, assigning an account code to each check. After the data for each check is entered, the new current balance is displayed. Deposits are entered in the same manner.

You can easily make corrections, view files, change account names, and update the balance. Four reports can be printed out, if you have an 80-column printer: transactions (deposits and expenses), deposits, expenses, and accounts (year-to-date).

A demonstration file is provided; "It is recommended that you practice with this file so you can make any mistakes on it instead of your own data," the manual says.

This program is fairly sophisticated, and can be recommended to those who find the ordinary check registers provided with checkbooks to be too simple for their needs. (Although the manual says this is a disk based program, Computerware quoted me a $19.95 price for cassette.)

Intro to Data Communications

This five-part Extended Basic program is said by the five-page manual to be designed "to teach a beginner the basic ideas and terminology to allow him (her) to use a data communications device easily."

The first four parts teach very elementary theory about modems, RS-232, synchronous transmission, baud rate, etc. A dozen illustrations make good use of color graphics. The fifth part is a multiple choice test with ten questions.

This program is $17.95 on cassette, $22.95 on disk. For $12.95, you can buy "TRS-80 Data Communications Systems," by Frank J. Derfler Jr. (Spectrum Books, Prentice-Hall Inc.) which, although disappointingly flawed, gives you a great deal more information, is much easier to read than a Color Computer screen, and has three dozen illustrations, and two dozen charts.

Short Program #41: Screen Saver III

From Valley Stream, NY, Matt Fitzgibbon wrote last year, "Lately I've seen, in computer magazines, many programs for saving the contents of the TRS-80 screen to string or numerical arrays." One of these is Short Program #31 (July 1982, p. 222).

"This program shows one strong fault

...a t.v.!
HEY! WHADDYA THINK YOU'RE DOING?!
THIS SET ONLY GETS ONE CHANNEL!
I'M NOT A TV! I'M AN UNEMPLOYED ROBOT!
I WISH THERE WERE MORE ACTION IN THIS SHOW...
© 1983 CHAS ANDRES

of screen-save programs written in Basic: they are generally very s-l-o-w! At least they used to be slow. I have been using computers since my freshman year in high school (about three years) and some time ago I wrote a program (entirely in Basic) which takes about one second to store the program.

"I'm sure that at one time or another, most TRS-80 owners have seen programs which use VARPTR to look at the variable pointer of a string. I reasoned that this function could also be used to change the pointer of the string and fool the computer into thinking that the video memory is nothing more than several string variables.

"The program in Listing 1 illustrates this technique. The screen is completely saved (except for the last four bytes) in SC$, from which it is printed back onto the screen. The part of the program that does the actual saving runs from line 70 to line 150.

"If anyone wants to use this as a subroutine in a marketed program, I ask nothing more than a simple REM."

"Lines 20-60 create a four-way kaleidoscopic graphics image; lines 70-150 save it; lines 160-170 reprint it on the screen."

Matt's program includes these REMs: "Line 10 puts some text on the screen; lines 20-60 put some graphics there too. In line 70, A$ will point to 255 consecutive bytes of video memory, and line 80 finds the pointer to the location of A$. In line 100, SL is the pointer to which 255-byte block of video is to be read; line 110 sets up bytes so we can make A$ point to location SL. In line 130, A$ is now pointing to the video. Line 140 saves this portion of the screen in array SC$. Line 160 clears the screen and reprints it from SC$."

Matt added a P.S., "Because this 'screen-save' stores graphics and is extremely fast, it can be used in the multitude of 'Etch-A-Sketch' programs. Screens can be saved to disk by simply saving the strings, SC$ (0)-SC$(3)." ☐

Listing 1.

```
0 CLS: CLEAR 2000: DIM SC$(3)
10 PRINT "Screen Save---Fitzgibbon"
20 FOR F = 1 TO 50
30 X = RND(63): Y = RND(20)+3
40 SET(X,Y): SET(127-X,Y)
50 SET(127-X,47-Y): SET(X,47-Y)
60 NEXT F
70 A$ = STRING$(255,0)
80 PT = VARPTR(A$)
90 FOR F = 0 TO 3
100 SL = F*255+15360
110 MSB = INT(SL/256)
120 LSB = SL-MSB*256
130 POKE PT+1, LSB: POKE PT+2, MSB
140 SC$(F) = A$
150 NEXT F
160 CLS: FOR F = 0 TO 3
170 PRINT SC$(F);: NEXT F
180 GOTO 180
```

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iews...book re

Steve Gray, et al.

Silicon Valley Guy Handbook, by Patty Bell and Doug Myrland. Avon Books, New York. 105 pages, paperback $3.95. 1983.

Two things led us to believe this ought to be a good book: first, it is modelled after the *Preppie Handbook* (a funny book), and second, it is published by Avon who just did the enormously successful (and funny) *Items From Our Catalog*. We were wrong. *Silicon Valley Guy* is a total yawn from cover to cover. It doesn't have one single "heh, heh" item or "in" joke. As Gene Shalit once said, "The author has committed ho-humicide with his typewriter." Pass this one by. If you receive this book as a gift, the person who gave it to you is your enemy; give it back. Yawn... —DHA

Some Common Basic Programs: TRS-80 Level II Edition, by Lon Poole, Mary Borchers and Karl Koessel. Osborne/McGraw-Hill, Berkeley, CA. 202 pages, paperback $12.99. 1981.

According to the title, these 76 programs, which will run on both the Model I and Model III TRS-80, are "common" ones. Well, perhaps if you work in the financial, statistical or mathematical field, these programs may be common to you. If not, you might never need any of them, other than perhaps some of the financial ones, and even those not all that often.

The 20 financial programs include Future Value on an Investment, Depreciation Rate, Term of a Loan, and Mortgage Amortization Table. Some of the 28 mathematical programs are Area of a Polygon, Coordinate Conversion, Integration by Simpson's Rule, and Matrix Inversion. Among the 17 statistical programs are Poisson Distribution, F-Distribution, Chi-Square Test, and Linear Regression. The remaining 11 programs are varied, such as Recipe Cost, Federal Withholding Taxes, Day of the Week, and Check Writer. (The programs were also originally offered on cassette, but this is no longer available.)

This book doesn't teach Basic programming, but you don't have to understand the language. Just copy the listings into your TRS-80 and run the programs as shown in the examples. (The book is also available in editions for the Atari, Pet/CBM, Apple and IBM PC.)

As usual with an Osborne book, this one is meticulously prepared. Each program includes a good sprinkling of explanatory REM lines, and is accompanied by a description, example, and sample run. Some include optional changes for altering the input or output of the original program. All require at least 4K, and are designed to fit a 64-column screen.

If you need enough of these programs to make the price attractive, this book presents them much better than nearly all other similar collections.

---

80 Practical Time-Saving Programs for the TRS-80, by Charles J. Carroll. TAB Books, Inc., Blue Ridge Summit, PA 17214. 251 pages, paperback $9.95. 1982.

Once more, a collection of Basic programs; and once more, programs you may never need—unless you're a mathematician, CPA, statistician or electronics technician.

The 80 programs are divided into five groups: Numbers (polar to rectangular conversion, complex functions, numerical integration), Finance (future value, loan amount, sinking fund), Statistics (permutations, ungrouped data, exponential curve fit), Electronics (gamma match, matching networks, microstrip), Geometry (inverse hyperbolic functions, great-circle calculations). Three appendixes provide a summary of Basic statements and commands, powers of two, and hex/decimal integer conversion.

Each program is accompanied by a description of what it does, a listing, a sample run and, where appropriate, graphs or partial schematics. The writing is pedestrian but serviceable.

If you work in one of the areas addressed by these programs, you might find some use for this book. But by now you probably already have a couple that provide most or all the standard short programs you need in the five categories. At least eight similar books have been reviewed here since review #1 in the Nov/Dec 1978 issue.

Problem-Solving Principles for Basic Programmers: Applied Logic, Psychology, and Grit, by William E. Lewis. Hayden Book Co., Inc., Rochelle Park, NJ. 174 pages, paperback $9.95. 1981.

This book, which also exists in Fortran, Pascal, and Interlingua (pseudo-coding language) versions, provides "not only a problem-solving background, but also alternative solution paths from which the reader may choose," according to the preface.

A six-page Chapter 1 introduces the basic building blocks of problem solving. Chapter 2, the book's longest (50 pages), provides nine independent "prescriptions" that apply to general problem solving, but which can help solve programming problems, such as "Reverse gears and work backwards," "Make sure there is a method to your madness," and "Step back and view the forest."

Thirteen advanced prescriptions are provided in Chapter 3, including "Extinguish fire with a brainstorm" and "A pound of analogy equals a ton of sweat." Chapter 4 concerns Solving Larger Problems, with approaches not provided in Chapters 2 and 3; the main theme is top-down programming. Chapter 5, on Debugging, applies many of the techniques discussed in previous chapters, and also provides 16 prescriptions, including "Determine if bug is consistent" and "Simulate with paper and pencil." A bibliography of 33 books (including Lewis's three similar works) concludes the text, which stems from a college course in structured programming.

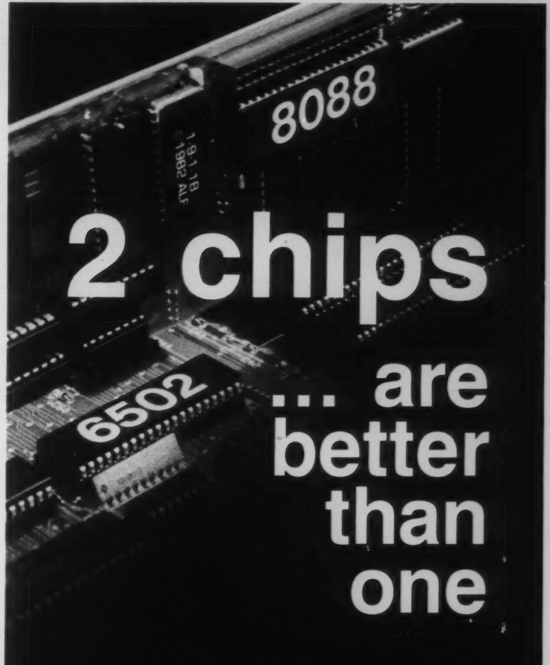
Each prescription is accompanied by one or more problems and at least one Basic program, all of which are described in enough detail to get across the basics of programming science. This book, written with a reasonable amount of detail and clarity, can be recommended to anyone having problems writing Basic programs; it may be the only one on the subject.

One curious feature is that the only attempt at humor in this otherwise quite serious text is in some of the prescription titles, such as "All eggs can be cracked" and "Beware of anxiety—it's heavy."

Introduction to Microcomputing, by Sydney B. Newell. Harper & Row, Publishers, New York. 627 pages, hardcover $24.95. 1982.

This introductory text, which assumes no prior knowledge of computers, electronics or engineering, concentrates on the 6800 microprocessor "so that readers can gain in-depth working knowledge from a single concrete model," the back cover says.

Designed to be used as a first- or second-year college textbook,



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or as a supplement to more advanced courses, or a self-teaching manual, or a quick reference for those familiar with the field, this book emphasizes applications over arithmetic. Many in-chapter worked examples reinforce each topic. Review questions are at the end of every chapter; later ones include suggestions for programming applications.

The 14 chapters cover an introduction, Number Codes, Non-numerical Computer Codes, Using the 6800's Instruction Set, Introducing the PIA, Aids to Program Writing (algorithms, flowcharts, assembler), Arithmetic Operations, Decisions, Loops, Tables and Lists, Subroutines, Interrupts, Serial I/O, and Introduction to System Configuration. Four appendixes provide the 6800 instruction set (86 pages), M6800 Cross Assembler Reference Manual (38 pages), answers to some of the exercises (the rest are in the Instructor's Manual), and Some Characteristics of the MC68000 16-Bit Microprocessor (52 pages). Over 30 percent of the book is appendixes; the text itself is only 399 pages long.

The writing is simple and straightforward, the coverage thorough, and the book well worth the reading for those who want a good introduction to microcomputers.

The Origins of Digital Computers: Selected Papers, edited by Brian Randell. Springer-Verlag, Berlin, Heidelberg, New York. Third edition: 596 pages, hardcover, $29.50. 1982.

Part of the series, "Texts and Monographs in Computer Science," this book has been expanded since it was first published in 1974, both in text and annotated bibliography; the latter now consists of over 850 items.

The book starts with the Analytical Engine that Charles Babbage started to design in 1834, and ends with two papers presented at the inauguration of EDSAC in 1949. "The aim has been to cover each significant milestone on the route from Babbage to EDSAC," according to the preface.

After an introductory chapter, the 34 papers are divided, by type of machine, designer or manufacturer, into seven more chapters: Analytical Engines (mostly Babbage), Tabulating Machines (mostly Hollerith), Zuse and Schreyer, Aiken and IBM (ASCC, CPEC), Bell Telephone Laboratories (relay machines), The Advent of Electronic Computers (ENIAC, plus papers by Atanasoff, Bush, Rajchman, Mauchly, and others), and Stored Program Electronic Computers (EDVAC and EDSAC).

Other familiar names appear as authors of these papers, including Hopper, Eckert, Alt, Goldstine, von Neumann, Williams, and Wilkes. Some are not familiar, and a few represent pioneers whose work has been almost forgotten—or are almost unknown in this country—such as Couffignal, Dreyer, and Phillips.

When possible, the original papers have been used, such as Ludgate's 1909 paper on the Babbage machine, the two papers by Aiken with many photographs and drawings (from IEEE publications), the Goldstine paper on ENIAC, et al.

The book "is intended for readers, such as computer science students or people employed in the computer field, who are interested in the history of their subject, and particularly in the technical details of the precursors of the modern electronic computer," according to the preface to the second edition. The third edition is highly recommended to all such readers as the best book available on computer history, containing a great wealth of detailed papers, collected with diligence and edited with great care.

eviews...book

6502 Assembly Language Subroutines, by Lance A. Leventhal and Winthrop Saville. Osborne/McGraw-Hill, Berkeley, CA. 559 pages, paperback $15.95. 1982.

The authors and the publisher apparently assume that if you don't know which computers use the 6502 microprocessor, you wouldn't be interested in this book, which doesn't reveal until page 54 that the 6502 is used in the Apple.

The first three chapters are tutorial, on General Programming Methods (with a quick summary for experienced programmers), Implementing Additional Instructions and Addressing Modes (how to add them), and Common Programming Errors. The 40-plus subroutines are contained in eight chapters, on Code Conversion, Array Manipulation and Indexing, Arithmetic, Bit Manipulation and Shifts, String Manipulation, Array Operations, Input/Output, and Interrupts. Three appendixes provide a summary of the 6502 instruction set, a programming reference for the 6522 interface adapter, and the ASCII character set. A 24-page glossary completes the book.

The book is as thorough as just about every Osborne publication, and just about as complex. Each subroutine is documented completely, including the purpose of the routine, procedure followed, registers used, execution time, program size, data memory required, special cases, entry and exit conditions, and examples.

Leventhal, already known for his clear, detailed writing about assembly language in several publications, adds another star to his crown with this excellent book, "aimed at the person who wants to use assembly language immediately, rather than just learn about it." This is not easy to read; the authors pack a great deal in each page, and a previous knowledge of assembler would help very much. If you have an Apple and want to know more than just Basic, to the extent you're willing to dig hard, buy this book.

Practical Data Base Management, edited by Auerbach Publishers Inc. Reston Publishing Co., A Prentice-Hall Co., Reston, VA. 444 pages, hardcover $24.95. 1981.

Contributors to the "Auerbach Data Base Management Series" are the "authors" of this book, written "to provide an easy-to-read, organized guide to the practical issues of planning, designing, and implementing data-base-supported information systems," according to the preface.

The 23 chapters are divided into five parts: databases, database management systems, data dictionary/directory systems, database administration, and user system interfaces.

With its emphasis on the practical, the book examines areas such as management issues in planning ("A tendency exists to tackle problems that take a long time to correct."), the database management system ("The requirements for the DBMS are significantly different from those the vendors have supplied to date."), the impact of personal privacy requirements on database administration ("Individuals should be able to inspect the personal information maintained on them and correct it if it can be demonstrated to be in error."), and many more.

Although geared to managers responsible for the planning, design, implementation and maintenance of a database environment, this book, by omitting overly technical detail, and by being written clearly and concisely, offers much worthwhile information to anyone wanting to understand databases and how to manage them. ☐

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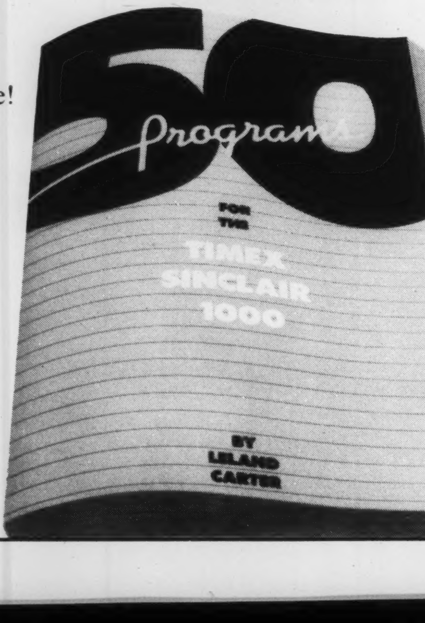

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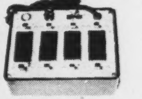

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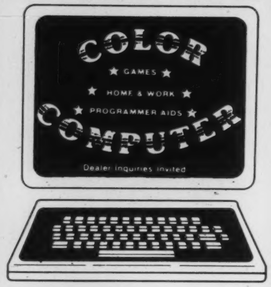

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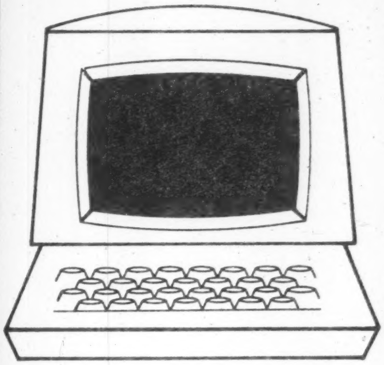

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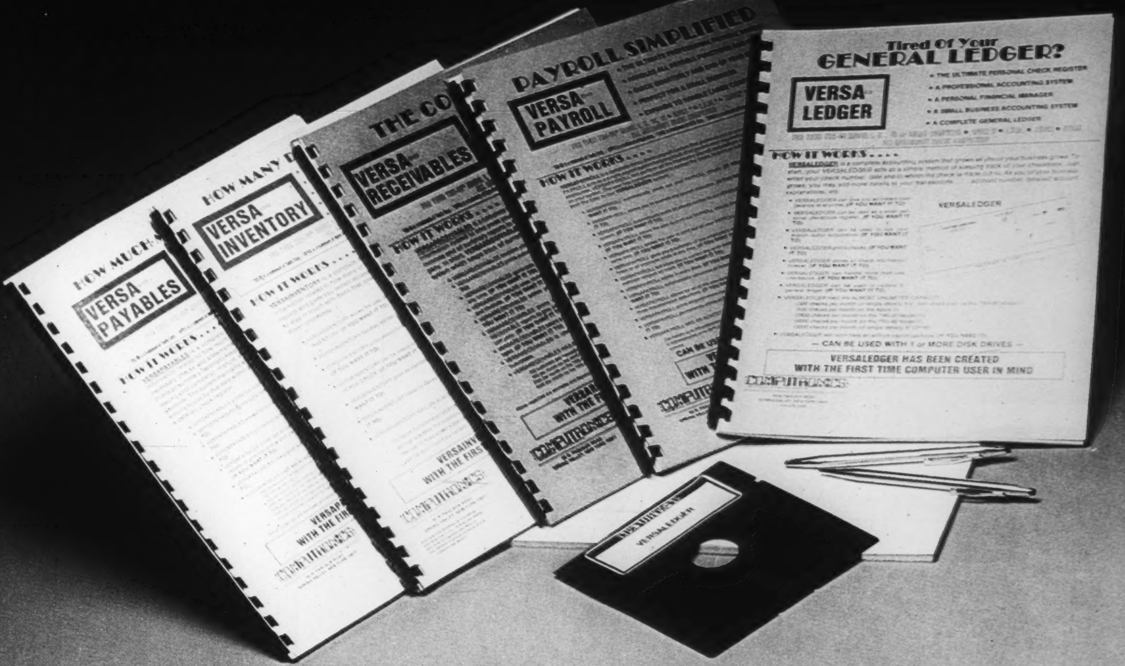

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